VOLUME 36
NUMBER 10

OCTOBER, 1949

plating

SETTING UP
POLISHING WHEELS

See Contents Page 1009

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Nickel plated steel scissors stripped clean and bright without attack.

new Developments For Metal Finishing

METAL STRIPPER "A" — An alkaline chemical stripper for removing coatings of nickel, copper, zinc, cadmium and silver from steel *without any attack* upon the steel. Excellent for removing plated coatings as well as surplus metal from brazing or welding.

CLEANER S-61 — A new alkaline soak-type cleaner that is remarkably effective even at temperatures as low as 150°F. for removal of oil, grease, and buffing compounds from copper and steel.

EBONOL "S-30" — A new quick blackening process for iron and steel. Produces jet black coatings in five minutes.

INHIBITOR 9 — A new inhibitor for both hydrochloric and sulphuric acids for pickling of steel without attack. Saves acids. Also inhibits against hydrogen embrittlement.

NYLON ANODE BAGS — New nylon anode bags for nickel, copper, silver and other plating solutions. Made to specifications.

"SURPREP" — A new phosphating type cleaner for rapid removal of rust, oil and grease from large objects. Can be applied by brushing, wiping or spraying.

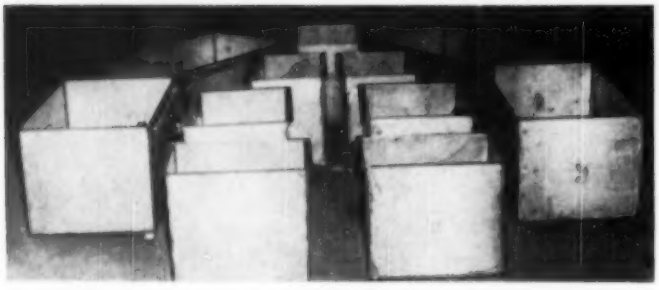
Write for New Bulletins on these Products

● *Fast action of SURPREP on oily steel*

Enthone INC.

442 Elm Street, New Haven, Conn.

Are you looking for the best way to avoid corrosion losses?



THE TREND IS TO STAINLESS

THIS GROUP of eleven, part of an order for fourteen stainless steel tanks, solves one customer's corrosion problems in cleaning and rinsing cycles. More and more the call comes for Stortswelded Stainless Steel Tanks—to halt the ravages of corrosion—to put an end to rising maintenance and replacement costs—by using stainless all along the line. These longer lasting, easier-cleaning tanks can serve you as they are serving others, a sound investment in protection.

Storts engineering staff is ready to assist you in the selection of material and on questions of design—to help you plan for maximum tank values at least cost.

STORTS WELDING COMPANY
INCORPORATED

42 Stone Street Meriden, Conn.

Manufacturers of Welded Fabrications to Specifications

Industry News

Electroplating Course in New York City. The College of the City of New York, School of Technology, will offer a course in Practical Electroplating during the Fall Semester. The course will be held on Monday evenings from 7:00 to 9:00 P. M. Registration will be held September 16 and 19 in the evening.

The primary objective of the course is to provide commercial electroplaters with a sound understanding of the principles underlying their work. For details, address Prof. W. Willig, City College, New York 31, N. Y., or phone WA 6-5400 during business hours.

Plating Week in Chicago, October 12-15. Not less than three organizations have scheduled meetings during this week, all at La Salle Hotel.

The first is *Committee B-8* on Electrodeposited Metallic Coatings of *American Society for Testing Materials* and its subcommittees and working groups, which meet on October 12–14.

The second is *The Electrochemical Society* which holds its regular Fall Meeting on the 13th through the 15th. The program includes a Symposium on Electrodeposition on the 15th. The 9–10 papers to be presented deal with such subjects as deposition of metals on aluminum; deposition of bismuth, molybdenum, chromium, and chromium-molybdenum alloys; high efficiency anode for alkaline tin plating; structure of "hard" chromium; an x-ray method for determining tin coating thickness on steel. The Electrodeposition Division of the Society will meet for luncheon on the same day. Other symposia deal with electro-organic reactions and corrosion.

Finally the *Editorial Board of the American Electroplaters' Society* meets in the afternoon of Saturday, October 15, to plan further the program for the 8th International Conference on Electrodeposition to be held in Boston on June 11-15, 1950.

Electroplating Course in Chicago. Illinois Institute of Technology began a course in "The Fundamentals of Electroplating" on September 19. Classes will be held once a week on Monday evening, and will be under the direction of Mr. J. M. Andrus, Secretary of the Chicago Branch, American Electroplaters' Society.

Du Pont Finishes Laboratory. Plans to build a $2,000,000 finishes research laboratory at the Philadelphia plant were announced recently by the du Pont Com-

Published monthly at 5000 N. Marvine St., Philadelphia 41, Pa. Entered as second class matter July 1, 1946, at the Post Office at Philadelphia, Pa., under Act of August 24, 1916. Copyright, 1949, by the American Electroplaters' Society, Inc. Subscriptions: Domestic and Canada, $4.00 per year, 50c per copy. Foreign, $6.00 per year, 75c per copy.

A. E. S. RESEARCH REPORTS

Complete sets of A.E.S. Research Reports published to date may now be purchased for only $5.00. They include the following:

Adhesion of Electrodeposits	1	$ .40
	2	.60
	8	1.00
Determination of Impurities in Electroplating Solutions (complete for nickel plating baths)	3	.40
	6	1.00
Stripping of Copper from Various Base Metals	4	.35
	7	.70
Porosity of Electrodeposited Metals	5	.80
	10	.50
Disposal of Plating Room Waste	9	.75
	14	1.00
Methods of Testing Thickness of Electrodeposits	11	.50
Physical Properties of Electrodeposits	12	.65
Effect of Impurities and Purification of Electroplating Solutions	13	.40
Total		$9.05
Less		5.00
Saving		$4.05

Orders will be filled in the order received as long as the supply lasts. To obtain your set, return the Reader Service Card in this issue filled out with the designation of this advertisement, A-771, and the name and address to which the reports should be sent. Your check or money order must accompany the order.

Buying metal cleaners on a trial-and-error basis is a costly process. The way to be sure of full value, *when you buy*, is to base your choice of products on the experience and reputation of the manufacturer.

Wyandotte Metal Cleaners are made by the world's largest producer of specialized cleaning compounds. In the complete Wyandotte line are cleaners for any soak, electrolytic, spray or tumble operation, as well as degreasing, paint stripping, burnishing and burring compounds.

Each Wyandotte formula is the result of extensive laboratory and field research and is based on 59 years' experience in chemicals; each product must meet the most exacting performance specifications.

No matter what your cleaning needs may be, your nearest Wyandotte Representative will be glad to fill them. In addition, if you are confronted with some special cleaning problem, Wyandotte's skilled technical service staff stands ready to help you.

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Industry News

pany. The building is expected to be ready for occupancy late in 1950.

The First A. S. T. M. Pacific Area National Meeting to be held in San Francisco, in the Hotel Fairmont, during the week beginning October 10, features some 70 technical papers dealing with engineering materials and related subjects, and many of the Society's leading technical committees will hold sessions.

The General Committee on Arrangements is headed by Dozier Finley, Research Consultant, The Paraffine Companies, with C. F. Ramey, Standard Oil Company of California, as Secretary-Treasurer.

A complete list of the technical papers can be procured from American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pa. Two sessions on paint and similar finishes at 9 A. M. and 2 P. M. on Thursday, October 13, are of special interest to this journal's readers.

The New Process Engineering Department of the Detrex Corporation will be headed by George W. Pew, according to an announcement by A. O. Thalacker, Vice-President and General Manager.

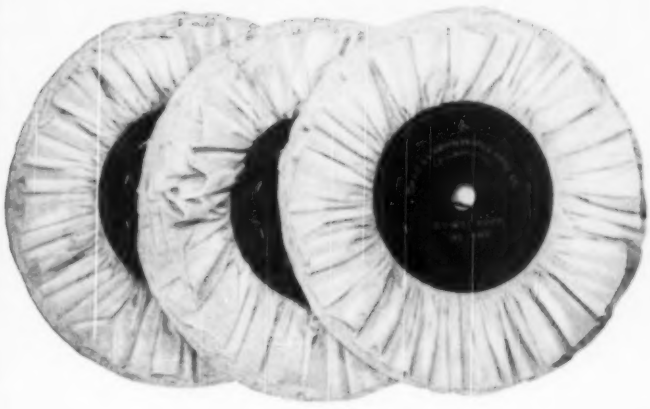
In addition to handling engineering requirements of Detrex factories—other than product design—this department will investigate and recommend operating methods and fabricating processes. It will also exercise complete quality-inspection control on all manufactured items except solvent and cleaning compounds. This includes degreasing and metal-parts washing machinery, drycleaning equipment, oil-extraction plants, and food-processing equipment. The main plant and general offices of Detrex Corporation are located at 14331 Woodrow Wilson, Detroit 32, Mich.

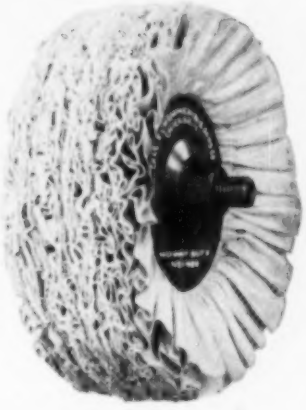
The Colonial Alloys Company, Small Parts Division, Philadelphia 29, Pa., is now offering to manufacturers and assemblers, fabricated and finished aluminum parts which are claimed to be better finished and have a lower end-cost than similar parts in polished and lacquered brass or copper, chromium plated, or gold and silver plated, metal parts.

Through proper selection of alloys, and use of Mirror Dipping to eliminate mechanical polishing and color Electrodizing, it claims to achieve a better product at less cost, with a resemblance to brass, copper, chromium, gold, silver, rhodium, etc. that is striking in its brilliance and color.

The company prefers to furnish and finish small parts in stampings, drawings, screw-machine products, cold-headings and small forgings, in production quantities. Manufacturers and assemblers are

RELIANCE PRODUCTS



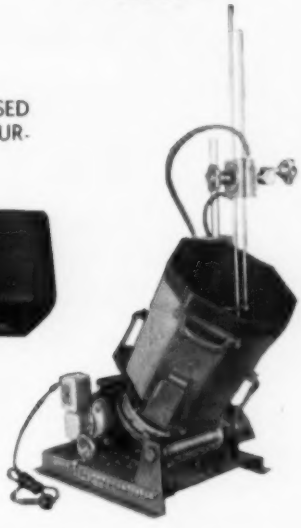


NUWAY BUFFS

MANY FOLDS TO HOLD COMPOSITION USED FOR FAST CUTTING, FLAT AND ROUND SURFACE WORK.

EXTRUDED COMPOSITIONS

MORE COMPACT, NO LOSS FROM BREAKAGE, MORE ECONOMICAL.



RELIANCE MIDGET PLATING BARREL

TUB CAN BE LIFTED OUT FOR DUMPING AND TUMBLING BARREL INSERTED FOR TUMBLING INSTEAD OF PLATING—VERY RIGID—THREE SPEEDS.

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Industry News

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Industrial Instrumentation School. A comprehensive 13-week course and two five-week courses have been scheduled for the period from August 15 to December 2 by the Brown Training School of Industrial Instrumentation, Brown Instruments Division of Minneapolis-Honeywell, Philadelphia.

As in the past the courses are designed primarily for customers, in order that they may obtain maximum benefit from their process-control equipment. The addition and opening of a new factory to the main Philadelphia plant of the company enables the training school to move to the plant annex where it will occupy double the facilities previously available.

Electroplating Correspondence Course. Joseph B. Kushner, Metal Finishing Engineer of New York City and Stroudsburg, Pa., announces that he is accepting enrollments in his personally conducted and supervised correspondence course in modern electroplating, "Electroplating Know-How".

The course, based on many years of experience in the field, was designed by Mr. Kushner to give practical electroplaters a solid foundation in the basic fundamentals of modern plating practices so that they can carry on their plating operations from a more up-to-date and scientific point of view and advance themselves in their work. It is also said to be of definite value to plant executives who want to know more about their plating operations, to control chemists who want a more practical view of the subject, and to supply men who want to give themselves a good background in the technique of modern electroplating. Theory is mixed with practice in a manner that makes learning a pleasurable experience for the student.

The course consists of over 500 pages of material divided into a series of 10 individually bound, printed and illustrated lessons: (1) Basic Principles of Plating, (2) Polishing and Buffing, (3) Cleaning and Pickling, (4) The Plating Baths, (5) The Alloy Plating Baths, (6) Metal Coloring and Lacquering, (7) Plating on Non-Conductors, (8) Testing Plated Deposits, (9) Special Plating Techniques, and (10) The Electroplating Business.

For complete details write directly to Joseph B. Kushner, Metal Finishing Engineer, Stroudsburg 2, Pa.

Azed, Inc., Formed To Produce Zinc Plating and Finishing Chemicals. Azed, Inc. (pronounced a-zed), a new corporation jointly owned by Poor & Company, Chicago, and the Acme Steel Company, Riverdale, Ill., has recently been formed to engage in research, manufacture and sale of products and processes for all phases of application and secondary treatment of zinc surfaces. The company will serve zinc electroplaters, hot-dip galvanizers, and zinc-base diecast manufacturers and finishers.

President of the new corporation is F. A. Poor, Chairman of the Board of Poor & Company. Vice-Presidents are C. S. Traer, Chairman of the Board of Acme Steel, and A. E. Chester, Research Director of Poor & Company. Vice-President and Treasurer is P. W. Poor, President of Poor & Company. P. W. Moore, Jr.,

Jenkins

is Secretary, and R. B. Jenkins, General Manager. Azed offices are located at 80 E. Jackson Boulevard, Chicago 4. Laboratories are maintained at Riverdale and Waukegan, Ill. The factory is at Waukegan.

Company officials state that the formation of Azed, Inc., is the outgrowth of over six years of research and development work, during which time numerous new chemical products and processes have

SPARKLER
horizontal plate
FILTERS

Good Plating Requires Clean Plating Solutions

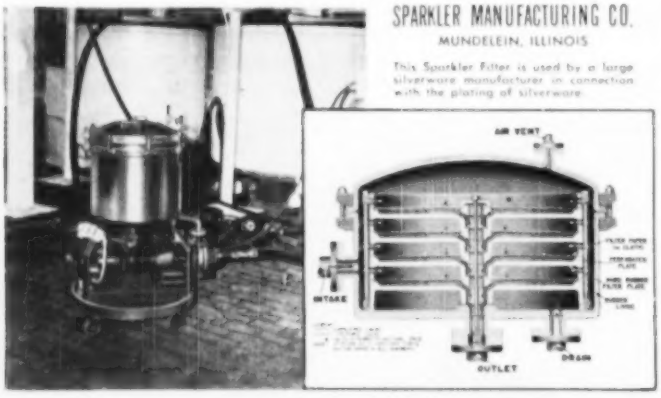
Sparkler Horizontal Plate Filters effectively remove all solids and precipitates from plating solutions—provide positive assurance that solutions are free from undesirable matter.

The horizontal plate principle used by Sparkler makes possible the formation of firm, stable filter cakes that will not slip or crack under intermittent or continuous flow. Flow through the filter is always *with* gravity, and filter aid is floated into position, forming a firm cake of even thickness.

The accompanying photograph shows a typical Sparkler installation in a modern plating plant. Previously, in this plant, silver chloride slurry was shoveled into crocks and laboriously washed by decantation. Now, chloride is mechanically agitated, collected, and washed in the Sparkler filter. Cost of the operation has been sharply reduced and quality of the chloride has been greatly improved.

Filters are pressure-tight and leakproof, and are available in rubber-lined construction, stainless steel, or iron. Capacities from 60 to 10,000 G.P.H.

Our Engineering Service is available for your specific problems.



SPARKLER MANUFACTURING CO.
MUNDELEIN, ILLINOIS

This Sparkler Filter is used by a large silverware manufacturer in connection with the plating of silverware.

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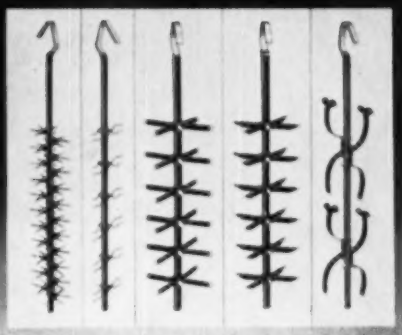
Time Savers For Platers

BELKE Electric Carboy Acid Pump — Transfers acids from carboys quickly and safely. Acid touches only the replaceable tube. Write for Bulletin 718R.

BELKE Current Density Meter—Hangs on cathode rod. Instrument dial shows amperes per square foot at plating surface. Write for Bulletin 439.

BELKE Permanent Tank Magnet—Recovers iron and steel pieces from bottom of plating tanks and barrels with minimum effort. Write for Bulletin 198R.

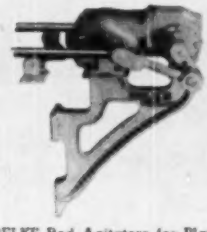


BELKE Utility Racks—*Enable you to plate new jobs without delay.* Five rack assortment efficiently handles 90% of all Plating Jobs, including bright nickel and chrome.

Removable tips and spines coated *independently* with **BELKE** Universal Plastic to withstand all cleaning and plating cycles. Spring pressure tips for copper-nickel-chrome service.

BELKE Vac-Seal removable tips join rack spines with seep-proof seal and are easily interchanged or replaced. All five models in stock for immediate shipment, assembled or unassembled. Write for Bulletin 980.

BELKE Rubberite Tank Lining — Unaffected by acids and caustics at room temperature. Easy to apply. Write for Bulletin 951.



BELKE Rod Agitators for Plating Tanks—A necessity for good bright nickel plating. Recommended for plating die castings. Produces more uniform deposits. Write for Bulletin 199.

BELKE Small Lot Plating Barrels —For use with your present still plating tanks. Plates small lots efficiently and at low cost. Available in two sizes. Write for Bulletin 239JP.

BELKE Scrap Anode Baskets — Coated with Belke Universal Plastic to withstand all plating solutions. Write for Bulletin 10-BG.

Belke MANUFACTURING CO.

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EVERYTHING FOR PLATING PLANTS

Most Complete Rack Manual Ever Produced

100 pages of experience-proven information. Practical rack construction methods. 560 proven designs of Racks, Tips and Hooks. Shows how to rack all shapes and sizes from jewelry to bumper bars.

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Duridine

Phosphate-coats and cleans sheet metal products in mild steel equipment for a lasting paint finish. Duridizing is sludge-free, low in cost, and simple in operation.

COLD SPRAY
Granodine

Forms a zinc phosphate-coating bond on sheet steel products—automobile bodies and fenders, refrigerator cabinets, etc.—for a durable, lustrous finish. Granodizing is a rapid, low-temperature process.

Thermoil Granodine

Creates a dense iron and manganese phosphate coating on steel, which, when oiled, provides exceptional resistance to rust and wear. The coating also provides a most effective paint bond.

Lithoform

A phosphate-coating chemical for galvanized iron, galvanneal, and other zinc or cadmium surfaces. Makes paint stick!

CHEMICALS ACP PROCESSES

RUST PROOFING AND PAINT BONDING
Granodine ®
Duridine ®
Rodine ®
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RUST REMOVING AND PREVENTING
Deoxidine ®
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PICKLING ACID INHIBITORS
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Write—or call Ambler 0486—for more information on these products, and advice on your own metal-working problem.

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Manufacturers of Metallurgical, Agricultural and Pharmaceutical Chemicals

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Industry News

been field tested and are ready for the market. It is claimed that the organization is engaged in the most comprehensive research program ever carried on in connection with zinc plating and finishing.

Instrument Course. The Fischer & Porter Company announces a number of vacancies for its next instrumentation course to be held at its Hatboro, Pa., plant, October 10 through 14. The course will cover manufacture, calibration, installation, operation and maintenance of the Company's complete line of "Flowrator" primary and secondary process-control instruments, with some time devoted to the basic principles of variable-area flow measurement. It is designed for engineers responsible for process-control instrumentation and for instrument specifications, installation, operation and maintenance.

Some guest accommodations in the town of Hatboro are available by pre-arrangement and there are frequent trains to Philadelphia, about 18 miles away. Further details can be obtained by writing to Fischer & Porter Company, East County Line Road, Hatboro, Pa.

Metal Finishing Service in Australia. Trem. Watson, Box 4572, G. P. O., Sydney, N. S. W., offers consulting service in various phases of metal working including metal finishing and electroplating.

SITUATIONS OPEN

TOP FLIGHT MANUFACTURING AGENTS AND JOBBERS Wanted in certain territories to sell Schaffner's Buffing Compositions and Supplies. We specialize in White Finish (Lime, Compositions), Grease Stick, Tripoli, Emery Cake, etc., in "Bar or Liquid Form". All up to 100 per cent saponifiable. These items can all be made to fit your particular customers' requirements. No account is too small or too large for our individual attention.

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SCHAFFNER BUILDING
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POSITION WANTED

Well known electroplater and chemist desires to make a new connection. Experienced in a large variety of finishing, such as automatic, still-tank and barrel plating of steel, brass and zinc, with common and precious metals, barrel finishing, electropolishing, etc. Good man with personnel. *Reply to:*

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P. O. Box 168, Jenkintown, Pa.

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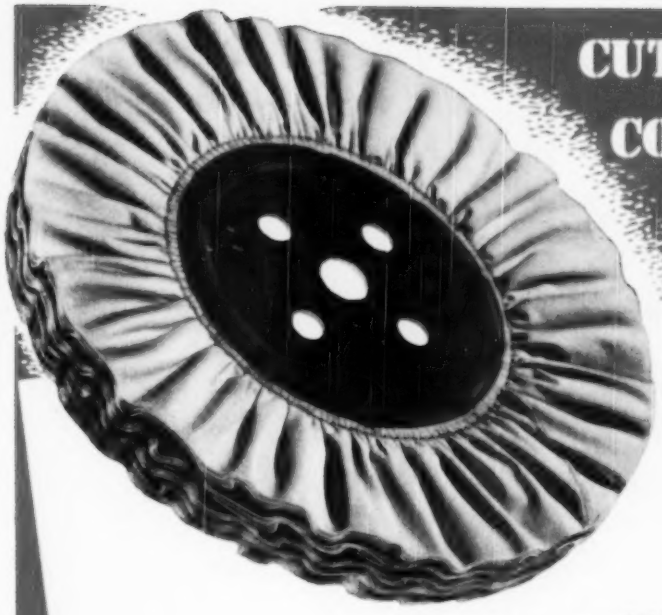


LONG LIFE

THE LONGER LIFE you get in Codman Ventilated NON-FRAY Buffs will result in **lower buff costs** in your plant.

RUGGED CONSTRUCTION of the NON-FRAY Buff makes it a champion against all "tough" jobs. Only the thread ends of best grade cotton sheeting are exposed to wear. NON-FRAYS stay longer in service.

RUGGED

COOLNESS AT ALL SPEEDS means peak efficiency. NON-FRAYS' deep, non-compressible ventilating channels allow free, constant air flow.

COOL

DON'T BURN YOUR PROFIT, EARN IT WITH CODMAN BUFFS.

BRANCH OFFICES.
DETROIT, LOS ANGELES
GRAND RAPIDS
PHILADELPHIA

THE MARK OF QUALITY

*THE REAL-VENT NON-FRAY VENTILATED BUFF IS MADE UNDER PATENT NUMBERS 2,027,863; 2,094,650; 1,973,961; RE. 19,884; 2,140,208. OTHER PATENTS PENDING.

For Over 50 Years the Greatest Name in Buffs

F.L.&J.C.
CODMAN
COMPANY
ROCKLAND · MASSACHUSETTS

Uniform Plating Voltage

within ±2% automatically with G-E "Packaged Power" Rectifier Units

Here is a way to secure uniform plating from your large plating tanks. With General Electric "2000" *Packaged Power* Rectifier Units—equipped with motor-driven induction control—the d-c output is automatically held within ±2% of the selected voltage. ***This—regardless of fluctuations in line voltage or tank load—and without attention by the operator.***

Flexibility—with "Packaged Power"

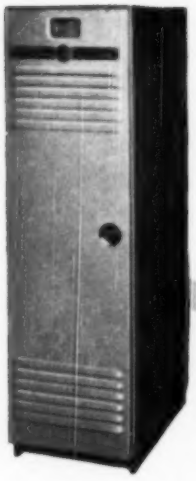
"Packaged Power" means decentralized power—with one package to power one tank at the voltage you want without rheostat losses. Each package contains its automatic control, its operator's control box and one to twenty or more rectifiers. To meet changing production needs, rectifiers may be grouped in parallel for heavy-current loads or in series for higher voltages. Additional rectifiers can be added or the entire package can be shifted easily, quickly.

High Efficiency—with "Packaged Power"

"Packaged Power" rectifiers cut your power costs. Their efficiency is better than 70 per cent from half-load to full-load—approximately 60 per cent even at quarter-load. Because these rectifiers use slow-aging copper-oxide stacks, efficiency continues high throughout their virtually unlimited life.

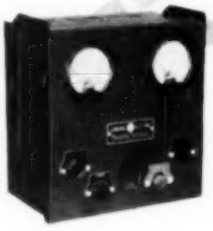
—And there's more to "Packaged Power"

Yes, there are other advantages for you with "Packaged Power." There's low initial cost, low amortization cost, full mechanical and electrical protection, and more—including the smaller 300-amp and 500-amp packages. We'd like you to have the whole story. Ask for Bulletin GEA-5247—"General Electric Copper-Oxide Rectifiers and Controls." *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*



Automatic Control—This control is motor-driven and fully automatic—maintains tank voltage within ±two per cent of any selected voltage. Of induction type, this control gives smooth uninterrupted adjustment of d-c voltage—under load. In a "Packaged Power" unit, this control will handle one to twenty rectifiers. (2000 to 40,000 or more amperes.)

"2000" Rectifier—This rectifier is especially well suited as a power supply for large tank and barrel plating as well as for cleaning and electroplating. Complete within itself, it contains long-lived copper-oxide stacks and is fully protected from electrical and mechanical failures. Basically a 2000-ampere 6-volt unit, it is also available in other voltage-ampere combinations totalling 12 kw. One to twenty or more rectifiers may be included in one "Packaged Power" unit.



TO TANK

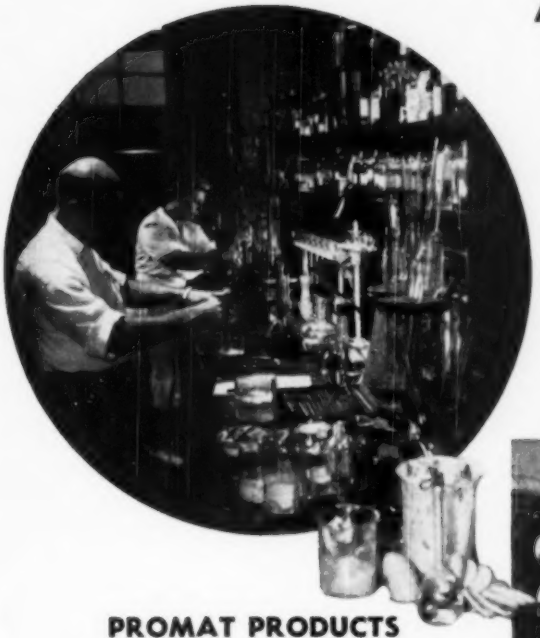
Operator's Control Box—A small separate panel installed at the plating tank. Has push buttons for START and STOP and for selecting plating voltage. Highly accurate voltmeter and ammeter show tank conditions.

—Wide Current Selection with "Packaged Power"

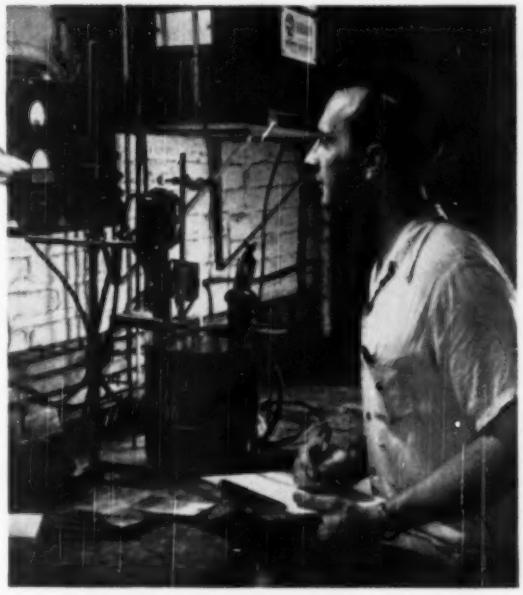
"Packaged Power" units in multiples of 12 kw, are available for outputs of 3 to 48 volts and 1000 to 40,000 amperes. Virtually any practical combination of current-voltage ratings are available within these wide limits.

GENERAL ELECTRIC

PROMAT.. *Headquarters for Better Zinc Finishing*



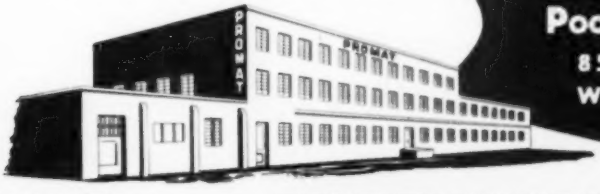
PROMAT laboratories, which are among the finest in the electroplating field, have developed a complete line of products and controls to provide the highest quality of zinc plating and secondary treatments. They stand ready to assist you in securing superior zinc finishes. For recommendations, submit your problems or requirements together with sample parts.



PROMAT PRODUCTS

- **PRO-SEAL FINISH** — bright protective treatment for any pure zinc surface. Unequalled for brilliance and corrosion resistance.
- **C-42 ADDITION AGENT** — produces a high performance, workable and economical zinc bath with a current density range from 15 to 200 amps per sq. ft. without burning.
- **DOCTOR SOLUTION** — an outstanding purifier for plating baths.
- **COMPLETE ZINC PLATING PROCESSES**
- **BRIGHTENERS FOR ZINC PLATING BATHS**
- **PROMAT "Z" BLACK FOR ZINC PLATE**
- **PROMAT PROSALT FOR THE COPPER PLATER**
- **PROMAT KICKER UNITS**

Dedicated to Research for the Improvement of Metal Finishing



PROMAT DIVISION
Poor & Company
851 So. Market St.
Waukegan, Illinois

"AJA-DIP" for those Cleaning Economies you want!

Magnus Aja-Dip Cleaning Machines Offer You Better Cleaning, Greater Flexibility and Speed — Speed — Speed!

Because they are so fast in their cleaning action, they are ready for another load when ordinary machines are just starting to clean. When they are used with the right Magnus Cleaner, they give you a much better cleaning job than still tanks, spray-type machines or any other cleaning method.

The reason is their unique operating principle, through which the work is moved up and down IN the cleaning solution many times a minute. This dynamic mechanical cleaning action supplements the work of the solution.

Proof?

STEEL PARTS — toys and tools, replacing vapor degreasing. Output ten times that of former method at one-half the cost.

SURGICAL INSTRUMENTS — replacing still tank soak in solvent plus hand brushing. Output many times that of former method. Over-all costs reduced 25%. Rejects on plating operation virtually eliminated. Workers freed for productive work.

AIRPLANE PARTS — propeller hub and governor assemblies. Former method, still tank soak and hand work. Output tripled. Costs reduced by 55%, while damage to delicate parts has been eliminated.

MAGNETOS — two complete magnetos an hour could be cleaned by former method. With Aja-Dip, thirty better cleaned units an hour are handled. One man and the Aja-Dip produce what four men did by hand methods.

There's an Aja-Dip Machine to meet your capacity needs. INVESTIGATE!

MAGNUS CHEMICAL COMPANY • 41 South Ave., Garwood, N. J.

In Canada—Magnus Chemicals, Ltd., 4040 Rue Masson, Montreal 36, Que.

Service representatives in principal cities

IN METAL CLEANING IT'S **Magnus**

CLEANERS • EQUIPMENT • METHODS

936 FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE # 780.

Personals

Dietrich

Dietrich New PLATING Ad Manager. Beginning September 1 the post of advertising manager for PLATING has been taken over by Walter C. Dietrich. He succeeds Allan R. Putnam, who is now Business Manager of the American Society of Tool Engineers.

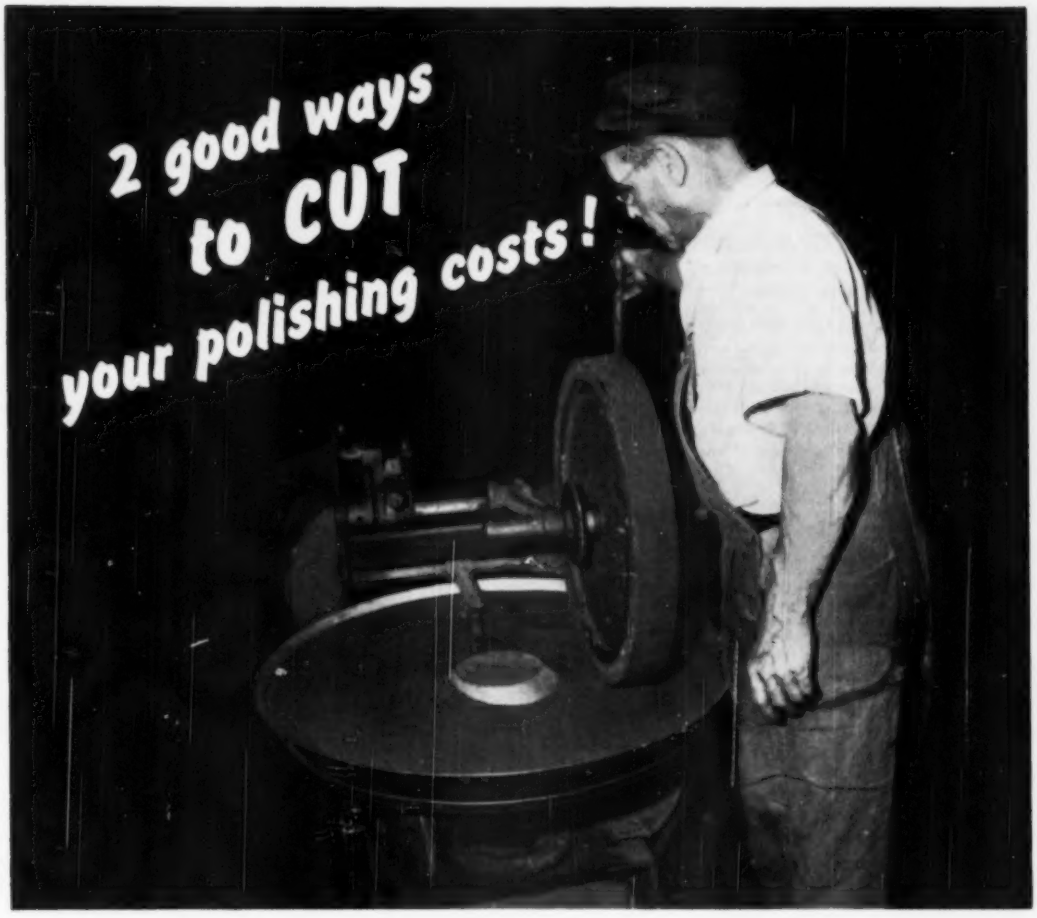
Mr. Dietrich comes with a background of both chemistry and business administration. He received his education at Temple University and University of Pennsylvania. Before joining PLATING he was actively engaged in the printing-ink business.

F. E. Warnes is now Director of Sales Promotion for Turco Products, Inc., 6135 S. Central Avenue, Los Angeles 1, Calif. He previously held the position of sales supervisor for the seven states of the Pacific Northwest. Mr. Warnes' headquarters will be in Turco's main offices in Los Angeles.

Work

G. B. Work has been appointed General Manager of the Industrial Finishes Department of the Atlas Powder Company succeeding **E. H. Bucy**, who has been transferred to the general office of the company at Wilmington, Del., for special duties. Mr. Work will have full managerial authority over the manufacturing, selling and technical operations of the department, including both the Stamford, Conn., and North Chicago, Ill., Divisions. He will make his headquarters at Stamford.

A native of Indiana, Mr. Work was previously Assistant General Manager of



(1) Take advantage of these cost-cutting features of Norton ALUNDUM Polishing Abrasive: its extreme hardness and toughness; its uniformity of chemical composition and crystal structure; its uniform grain size; its high capillarity; its variety of shapes and types of surface treatments.

(2) Take advantage of the many helpful tips on polishing and setting-up metal polishing wheels and belts offered in this interesting 44-page Norton booklet. Send for your free copy—no obligation of course.

This illustration of a glued wheel being rolled automatically is typical of the many helpful pictures shown in the booklet described below.

G-214A

NORTON COMPANY • WORCESTER 6, MASS.

Warehouses in Five Cities • Distributors in All Principal Cities
Consult Your Classified Telephone Directory

NORTON ABRASIVES

Personals

the Industrial Finishes Department. Prior to coming with Atlas he was with the Glidden Company as Industrial Sales Manager of its Finishes Division at Reading, Pa. He studied chemical engineering at Ohio State University.

Dr. Paul J. Brodeur is now Chief Chemist of the Metal Finishing Division of the Pyrene Manufacturing Company, Newark, N. J. He has had wide experience in metal finishing, especially hard chromium plating. For more than five years he served as a Major in the Chemical Warfare Service. He received his B.S. degree from Penn State in 1929, his Master's degree from University of Minnesota in 1932, and his Ph.D. degree from Columbia in 1940.

Henry J. Dougherty has been appointed Secretary of the Maneely Chemical Company, Philadelphia, Pa. He was formerly head of the Real Estate Division of an affiliated company, the John Maneely Company, since 1942.

R. A. Emmett, Jr., has been made a Special Assistant to the General Manager of the Detrex Corporation, Detroit, and will supervise material control, production scheduling, inspection, and safety. **J. Doyle Hamacher** has been made Superintendent of the equipment manufacturing plant. He will also retain his previous title and duties as company Plant Engineer.

W. A. Severance has been appointed Chief Chemist in charge of research and development, product control and special customer problems in the field of corrosion-proofing by The Cellkote Company, Rockefeller Building, Cleveland, Ohio. He was formerly with the Parker Appliance Company, Cleveland, Ohio.

Edison Sickman has been appointed District Sales Manager of the Middle Atlantic territory of The Atlas Mineral Products Company. **Howard Sterling,** a member of the supervisory staff, has been transferred to the sales department and will be located in the Southern California district.

Dr. J. C. Warner, Dean of Graduate Studies and Assistant Director of the College of Engineering and Science of Carnegie Institute of Technology, has been named President-Elect of the Institute. He will succeed Dr. R. E. Doherty when the latter retires on July 1, 1950.

Dr. Warner joined the Carnegie faculty as instructor in 1926, and became Professor of Chemistry and Head of the Chemistry Department in 1945. During the war he directed work on the purification of plutonium and participated in the operation of the Clinton Laboratories at Oak Ridge, Tenn. He is the author of several textbooks in chemistry and over 50 papers in the field of physical chemistry and electrochemistry. He is one of three Directors-at-Large of the American Chemical Society and Vice-President of the Electrochemical Society.

Moffatt

W. H. "Tye" Moffatt has been appointed Field Representative for The Udylite Corporation in Rochester, N. Y. He will reside at 51 Fernwood Park, Rochester 9.

Mr. Moffatt joined The Udylite Corporation in 1941 as a member of the laboratory staff. After a period in the armed forces, he returned to Udylite in 1946 and was made Service Engineer for the State of Michigan. During the past year, he has represented Udylite as Sales and Service Engineer for New York State. A native Detroiter, he attended the University of Detroit, Ontario College of Pharmacy, University of Toronto, and the Detroit Institute of Technology.

Philip Heilberger is now Senior Lacquer Chemist of the Stamford, Conn., branch of the Atlas Powder Company's Industrial Finishes Department.

Mr. Heilberger was with R. L. Evans Associates, Chemical Consultants, in New

Is METAL PARTS CLEANING *a bottleneck in your plant?*

DEGREASERS

WASHERS

DRYERS

A complete line of OPTIMUS Equipment is available in standard and special sizes to meet every metal parts cleaning problem and allied processing applications.

OPTIMUS VAPOR DEGREASERS are available in all various types and stages, straight vapor, vapor-spray, liquid-vapor and combinations of these. All sizes from simple batch type degreasers to custom built monorail or cross rod conveyor models.

OPTIMUS METAL PARTS WASHERS — single or multiple stage — screw or conveyor, mesh belt or monorail types. Can be applied to a wide range of operations as well as the handling of rust preventatives and other coatings.

OPTIMUS DRYERS embody a specially designed system of directional air jets which assure spotless drying after plating or polishing and before subsequent painting, plating or lacquering.

Submit your metal parts cleaning problem to our engineering staff.

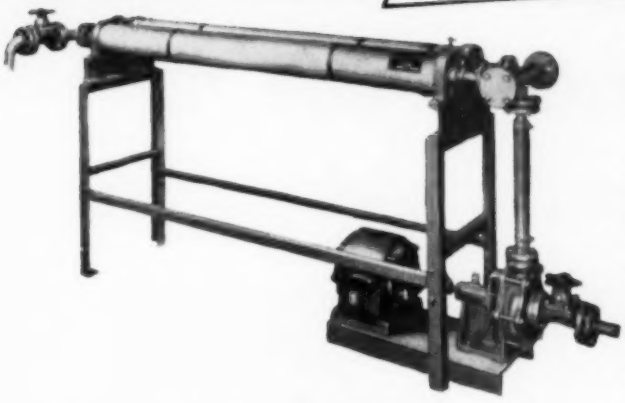
Distributors of
"Midsolv"
A Perchlorethylene Degreaser Solvent
"Triclene D"
A Trichlorethylene Degreaser Solvent

Send for complete catalog and additional information

OPTIMUS EQUIPMENT COMPANY
13 Water Street **Matawan, N. J.**
Offices in principal cities

OPTIMUS EQUIPMENT
FOR CLEANING · RINSING · DEGREASING · PICKLING AND DRYING OF METAL PARTS

Industrial's HEAT EXCHANGERS FOR PLATING SOLUTIONS



The Same Unit for Heating and Cooling

That's one big advantage of INDUSTRIAL'S Unit Heat Exchangers — you use the same unit for both heating and cooling. Maintaining the desired working temperature, by continued heating or cooling in the one unit, simplifies controls and operation. The units are adaptable to either manual or automatic control.

INDUSTRIAL'S Unit Heat Exchangers are available complete with pump and stand, or tubes alone can be had for wall or ceiling mounting. A wide choice of capacity, too, is possible by using from one to six tubes in a unit. Special units are readily engineered to meet unusual capacity or space requirements.

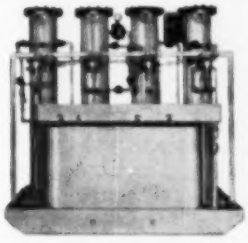
The design of the unit heat exchanger permits the use of pure nickel, copper, steel, or special alloy for the heat exchanger tubes, depending upon the plating solution. Rubber-lined headers and diaphragm valves are used when required. The pumping unit is of an alloy suitable to the solution involved. Ease of inspection and cleaning is assured by a simple header construction.

★ *Write for full information and recommendations*

INDUSTRIAL'S WATER DEMINERALIZERS and WATER SOFTENERS

for

Water that leaves no stains after hot rinse
Water that causes no unwanted precipitates in solutions

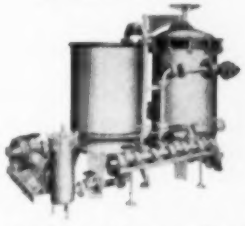


Model L-200 Four-Bed Industrial Water Demineralizer for a nominal flow rate of 200 gph. Other standard models available with capacities of 5 to 1000 gph. Special units of any capacity engineered to requirements.

INDUSTRIAL'S FILTERING SYSTEMS

for

Dependable Results in Solution Clarification



A typical Industrial Stationary Filter System. Standard models—portable and stationary types—are available in capacities of 100 to 15,000 gph. Special filters are engineered to meet unusual requirements.

INDUSTRIAL FILTER & PUMP MFG. CO.

1635 West Carroll Avenue • Chicago 12, Illinois

FILTERS
Pressure Type

PUMPS
Centrifugal

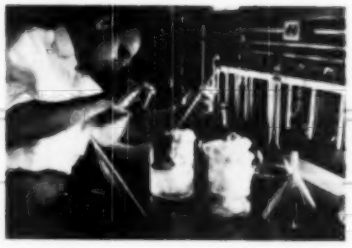
CORROSION TESTING APPARATUS
Salt Fog
Humidity

RUBBER DIVISION
Vulcanized Linings • Molded Products

WATER DEMINERALIZERS

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 783.

There is no longer need for bright zinc to cost so much



Photographed in Azed Laboratories

THERE is no question that the development of bright zinc baths has encouraged interest in the use of zinc, not just as a protective finish but also as a decorative one. But, until now, the promise has not been fulfilled.

Low cost protection — the very reason for the use of zinc as a coating metal — has been sacrificed in bright zinc baths. The cost has been placed beyond the reach of a large portion of those who desire a bright finish on their product. The protective power of the zinc coat has been seriously reduced. Covering power, throwing power, operating ranges and adequate metal deposition have all been bypassed in the rush for a bright deposit that will retain brightness for but a very short time.

The answers to these problems have now been successfully solved by Azed laboratories as part of an over-all program of research in zinc finishing technology. Entirely new Bright Zinc Systems have been developed which utilize addition agents costing but a fraction of a cent per gallon and Secondary Treatments so economical that better bright zinc at lower cost is now a reality! Here are examples:

1. Processes for alkaline or acid zinc plating at a cost so low that even the most inexpensive products can be bright finished — with no loss of corrosion resistance.
2. Processes for alkaline or acid zinc plating which give the most brilliant finish available *plus* a highly protective film at a cost substantially lower than any comparable finish.

Full details on Azed Bright Zinc Systems and other processes available on request.

AZED inc., 80 East Jackson Blvd., Chicago 4, Illinois

Laboratories at Riverdale and Waukegan, Illinois

PROCESSES FOR BETTER, LOWER COST APPLICATION AND TREATMENT OF ZINC

Personals

York City for four years, and later with a large eastern manufacturer of industrial finishes. He is a graduate of Brooklyn Polytechnic Institute and holds an M.A. degree in Chemistry from Cornell University.

Dresser

George E. Dresser, Manager of Hardware-Automotive Sales for The Carborundum Company, Niagara Falls, N. Y., since 1920, is retiring after 42 years' service on the company's sales force. He is being succeeded by **Charles W. Sprenger,** who was Manager of Carborundum's New York office from March

Sprenger

Mercer

1, 1944, until he was appointed Assistant Manager of Hardware-Automotive Sales on July 1, 1947. **L. P. Mercer,** formerly Manager of the company's Sales Training Department, has been selected as Assistant Manager of Hardware-Automotive Sales. Messrs. Sprenger and Mercer will operate from the Coated Products Division's headquarters at Wheatfield, N. Y.

Mr. Dresser is well known in the hardware and automotive trades, having served on important trade committees and been interested in the activities of many of the organizations in these fields.

Earl J. Mills, Manager of Less-carload Sales for Diamond Alkali Company in its Chicago Sales Office during the past two and one-half years, has been appointed Manager of the Southwest Sales District, which embraces the states of Texas, Oklahoma and Kansas. **Charles W. Klaus,** Manager of Carload Sales at Chicago since 1947, has been named to take complete charge of Diamond sales activities affecting Illinois, Indiana, Iowa, Michigan, Minnesota, Wisconsin and Nebraska. Mills is headquartered at Houston, Texas, while Klaus remains at Chicago.

Following an association of several years with the Lever Brothers Company, Cambridge, Mass., Mills joined Diamond as a sales and service representative in 1932, becoming attached to the company's silicate detergent merchandising organization, where he first concentrated his attention on commercial power laundries and subsequently broadened his activities to include other industrial detergent fields.

Klaus was associated with the old Central Commercial Company in Chicago for 17 years prior to joining the Benner organization in 1928 as a sales representative. Ten years later, Klaus became secretary of the company, a post he held until 1947.

W. H. Webb, who has had many years of experience with Detrex Corporation, Detroit, in analyzing cleaning applications of specialized nature, has been placed in charge of the alkali and emulsion phases of sales, service, and consultation in central United States. **Alan Harris,** who specializes in field development of Detrex cleaning compounds, will serve the industry in the Detroit area.

Gordon C. Curry is now Eastern Sales Manager of Precision Castings Company, Inc. Mr. Curry has been assistant to the President of the Kalamazoo plant for the last three years, prior to which he was connected with the Hoover Company Die Casting Division, of North Canton, Ohio.

Since the days of the Tandem Bike...

BLAKESLEE
HAS PIONEERED
METAL PARTS WASHERS

In the days when handle bar mustaches, derby hats and celluloid collars were popular . . . Metal parts were already being washed in Blakeslee washers.

Blakeslee engineers are constantly improving cleaning methods and speeding up cleaning operations to keep pace with modern mass production methods. Experience in handling every metal piece, from small watch parts to Diesel engine crank cases, has given Blakeslee engineers the "know how" to solve your particular cleaning problems.

A qualified Blakeslee representative is located near your plant. Write, wire or phone and he will be pleased to discuss your cleaning problems with you.

FOR WASHERS OR SOLVENT VAPOR DEGREASERS BLAKESLEE HAS THE ANSWER

BLACOSOLV DEGREASERS AND SOLVENT

NIAGARA METAL PARTS WASHERS

G. S. BLAKESLEE & CO.

G. S. BLAKESLEE CO., CHICAGO 50, ILLINOIS
NEW YORK, N.Y. TORONTO, ONT.

THE FIGURES IN PARENTHESES, SEE READER SERVICE CARD, INDICATE A 7B5.

CUT

COSTS

INCREASE Production per Buffing Wheel Dollar

The life of a buff . . . and your production from a buff wheel . . . depend solely on the buff you select.

Specify the Jackson Airway Ventilated Buff. It lasts longer . . . consumes less compound . . . reduces rejections . . . is the answer to your demand for economical performance.

Don't fool around with just-as-goods and imitations . . . also-rans and the forgottens.

Better performance and true economy are INSURED when you specify the Jackson Airway Ventilated Buff. For proof write us . . . and run a test in your own plant.

JACKSON BUFF CORPORATION

21-03 FORTY-FIRST AVENUE • LONG ISLAND CITY 1, NEW YORK

JACKSON AIRWAY Ventilated BUFFS

WE OFFER
20 YEARS EXPERIENCE

BULK CHROMIUM PLATING

Screws, Rivets, Bolts, Nuts, Washers, Eyelets,
Small Stampings, Shells, Turnings, Wire Items, etc
All Machine Screws Gage checked and Plated to Gage Fit

HIGH LUSTER
ROLLED OR BUFFED FINISHES

Automatic Buffing of Screws, Shells, Caps.

ALL PLATING INSPECTED

Rejects refinished and work returned complete.
Will stand Crimping and Bending.
Plating controlled to Dimensional Tolerances.

SPECIFICATION PLATING

Plating thickness and Corrosion Resistance assured by
Magna-Gage and Microscopic Thickness Tests and Salt Spray
Complete Laboratory Control.

The **CHROMIUM PROCESS** *Company*
SHELTON, CONNECTICUT

Assistance gladly rendered on Dimensional Allowances or other Plating Problems. No Obligation. Samples plated without charge.

1004

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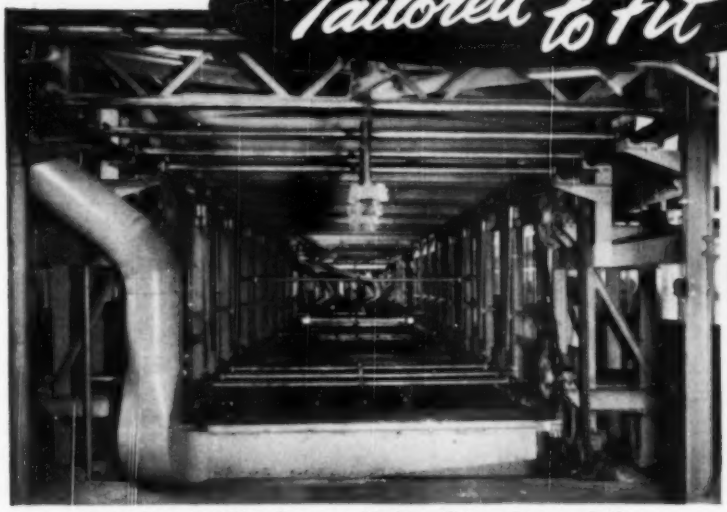
MEAKER Electroplating Machines

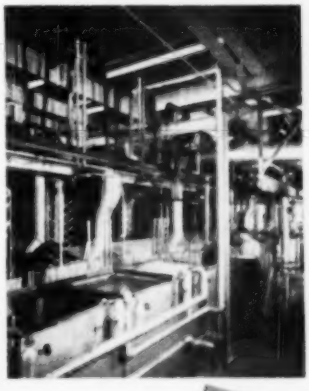
Tailored to Fit



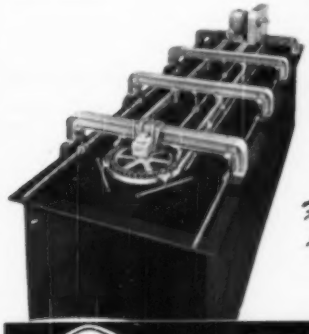
Typical Meaker Straight-A-Way Automatic Machine. This machine was built for copperplating three rows of work simultaneously. It handles 125 racks per hour that are 16 inches wide, 14 inches thick, and 70 inches long.

Meaker Special Machine designed for cleaning and silver plating small, brass contact clips. The unit is loaded at one point and the parts are carried through the operating sequence and automatically discharged into a container when completed.

Meaker Return-Type Automatic Machine for chromium plating the large variety of parts in a high-quality line of plumbing hardware.



A Meaker Semi-Automatic Machine for use in medium-output plating departments. This type equipment is used in large, job plating plants to supplement the capacity of automatic machines.



Equipment tailored to fit your requirements, making every operation in the plating sequence automatic, or as mechanized as possible, is the profitable way to handle electroplating on a production basis. This Meaker method applies equally well to departments with only moderate daily output and to the largest and heaviest automatic plating needs of the mass production plants. It offers not only a lower unit cost, but the production is increased, and a better and more uniform quality of product is assured.

Write for the Full Information. Ask for Booklet No. 148 →

50th Anniversary 1899 1949

Serving the Plating Industry with the Best, Most Up-to-Date Equipment

THE MEAKER COMPANY

1639 South 55th Ave., Chicago 50, Illinois • Telephone CRawford 7-7202

Would You Spend A Dime . . . TO SAVE A DOLLAR?

THESE ROHCO PLATING AIDS ARE SAVING VALUABLE TIME AND MONEY IN HUNDREDS OF PLATING PLANTS!

How Can You Afford To Pass Up These Unusual Savings In Your Plant?

THE 5-MINUTE HULL CELL TEST—The Plater's Stethoscope

CONTROL YOUR BATHS, YOURSELF, AND LEARN THEIR OPERATION . SAVES DELAYS IN OUTSIDE TESTS . SAVES NON-PRODUCTIVE BATH TIME . REDUCES REJECTS . IMPROVES QUALITY . KEEPS YOUR BATHS AT BEST OPERATING EFFICIENCY AT ALL TIMES

ROHCO 20XL CADMIUM BRIGHTENER

SAVES HIGH COST CADMIUM—BECAUSE HIGH THROWING POWER MEANS LEAST AMOUNT OF CADMIUM PLATED FOR MINIMUM SPECIFICATION THICKNESSES—PROVED IN PLANT TESTS . LOW METAL BATH WITH LOW DRAGOUT COST CAN BE USED

NO-CRO-MIST FOR CHROME BATHS

ELIMINATES UNHEALTHFUL "Chromic Acid Smog" . SAVES IN MAINTENANCE (BUSBARS, RACKS, VENTILATORS) . SAVES CHROMIC ACID . PLANT TESTS PROVE ITS COST IS USUALLY LESS THAN THAT OF CHROMIC ACID SAVED!

ROHCO

R. O. HULL & CO., INC.
1277 West 3rd Street
Cleveland 13, Ohio

"YOUR PLATING IS BEST WITH THE HULL CELL TEST"

TO GET THE FACTS—PIN THIS TO YOUR LETTERHEAD!

CHECK INFORMATION DESIRED

- ☐ HULL CELL TEST
- ☐ ROHC 20XL
- ☐ NO-CRO-MIST

R. O. HULL & CO., Inc.
1277 West Third Street
Cleveland 13, Ohio

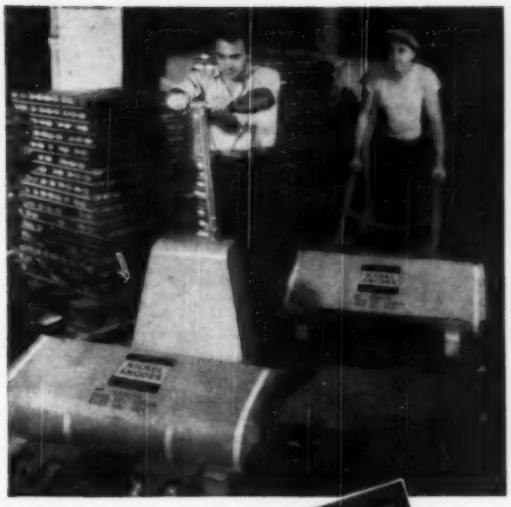
Name..... Title.....

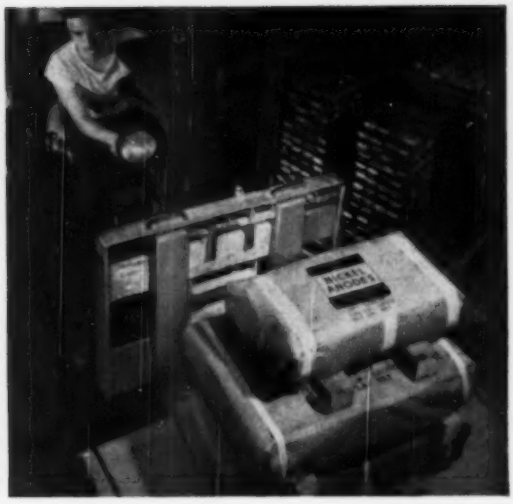
Company.....

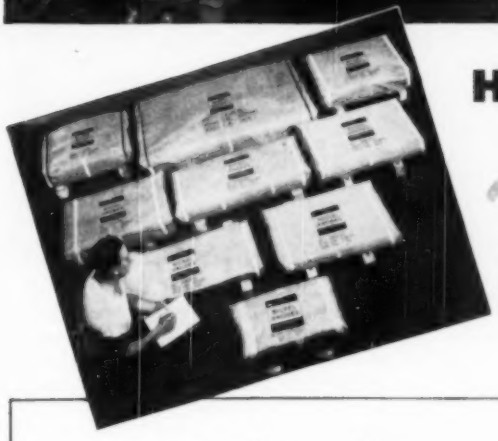
Address.....

City & State.....

FOR FURTHER INFORMATION, USE READER SERVICE CARD. INDICATE A 788







HARSHAW *Packaged Anodes*

easy to handle

easy to open

no deposit

no return

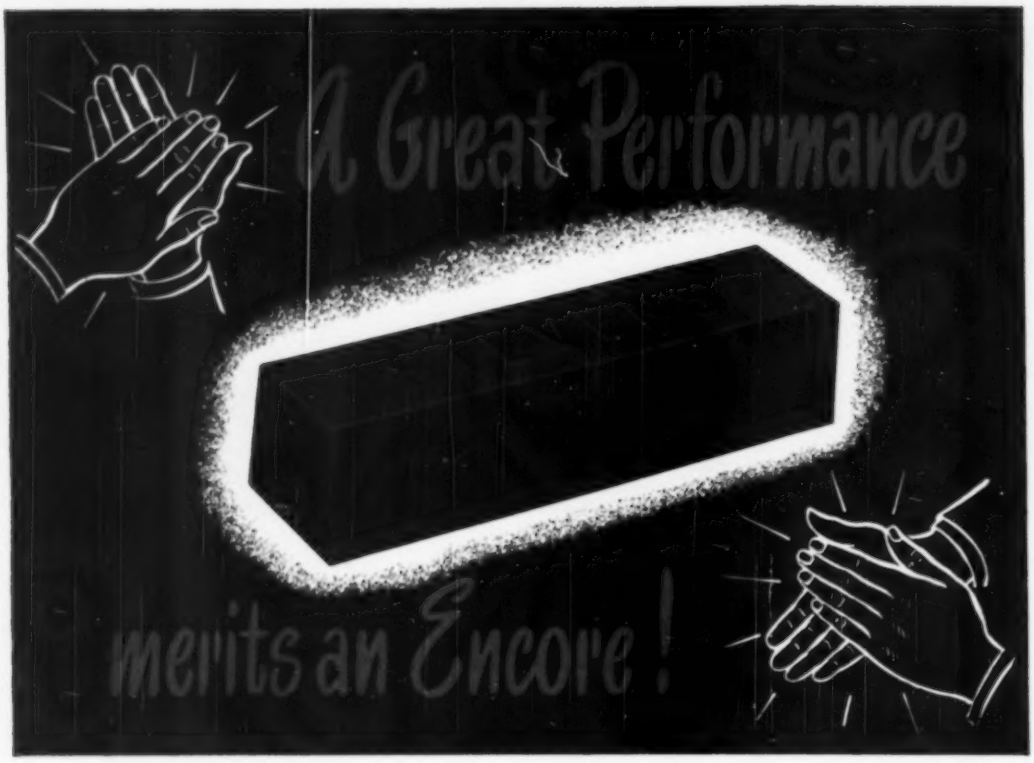
no extra cost

keeps anodes clean

Harshaw anodes are now delivered in compact packages at no extra cost to the customer. The new Harshaw anode packages, which feature built-in skids, facilitate quick handling by mechanical or hand trucks. These anode packages stack easily and quickly. No container deposits or returns are necessary. Order your anodes from Harshaw. You will get a dependable product wrapped in a compact, protective package.

THE HARSHAW CHEMICAL CO.
1945 East 97th Street, Cleveland 6, Ohio
BRANCHES IN PRINCIPAL CITIES

HARSHAW



—when Stevens Compositions play the leading role in Your Metal Finishing Operations

Just as "curtain calls" or encores measure the popularity of a performer in the theatre, so does continued usage signify product acceptance in the field of metal finishing.

Where economical, efficient production is called for, Stevens "job-qualified" compositions have long been known for their ability to "come through" with a dramatic performance. There's a reason. Absolute *quality-control* through all phases of formulation, plus over 45 years of specialized composition manufacturing experience, qualify Stevens finishing materials to do an exacting job, do it well and keep on doing it. Such performance merits an encore and gets it in the form of repeat business which keeps Stevens compositions on the job.

If your present or contemplated buffing or polishing operations involve the precision finishing of metals, plastics or new alloys—let Stevens make those operations profitable for you.

Should your requirements be such that they cannot be answered by a "job-qualified" composition in our Standard Line, Stevens' finishing specialists and laboratory staff will be glad to work with you and develop a "tailored-to-the-job" material that will exactly meet your particular finishing need.

Stevens men, methods and materials are dedicated to helping you solve your most vital finishing problems. *All we need is a "cue" from you. We'll follow through promptly.*

SINCE 1882

LEADING MANUFACTURERS OF POLISHING, BUFFING, PLATING EQUIPMENT AND SUPPLIES

FREDERIC B. Stevens INCORPORATED

DETROIT 16, MICHIGAN

BUFFALO • NEW HAVEN • INDIANAPOLIS • CLEVELAND

FREDERIC B. STEVENS OF CANADA, LTD. WINDSOR, TORONTO, ONTARIO

METAL FINISHING EQUIPMENT AND SUPPLIES DIVISION

The cover picture which shows how buff sections are glued and assembled is part of a story on page 1020 entitled "Setting Up Polishing Wheels"

PLATING is abstracted regularly in Chemical Abstracts, Engineering Index, Technical Data Digest and Bulletin Analytique.

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plating

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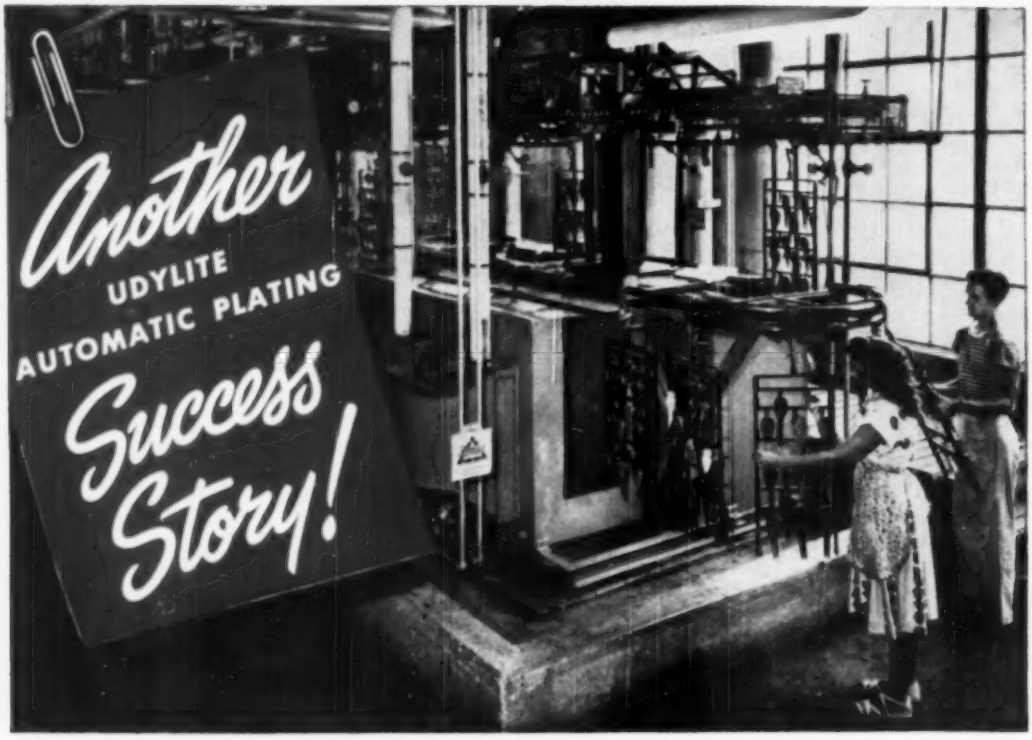

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Editorial

Fourth International Electrodeposition Conference

IT IS A HEARTENING thought that whatever rivalry there may exist between nations it does not have to extend to individuals. A testimony to this is the close cooperation that exists between scientists and technologists in different countries. They know that no nation has a patent on ingenuity and inventiveness.

The Fourth International Electrodeposition Conference, to be held in Boston June 11-15, 1940 in conjunction with the 37th Annual Convention of the American Electroplaters' Society, is an excellent example. It is our English friends in the Electrodepositors' Technical Society who first thought of the idea and who have nurtured it ever since. The first conference was held in London in 1937 and was closely followed by a second conference in Asbury Park, N. J., in 1939. After the interruption occasioned by the war, the English were again the hosts of the third conference in London, in 1947. Now it is the Americans' turn. Invitations and publicity releases have been sent to all corners of the earth, and many foreign contributions are expected as a result.

Some Americans, looking at the advances made in this country, may not appreciate the debts owed to citizens of other lands for leading the way, not only in the long ago but also in the recent past. One need only recall the basic researches by Jacquet of France on electropolishing, the many papers dealing with nickel plating by Macnaughtan, Hothersall, Gardam and others of the English Woolwich school, or Springer's of Germany studies of *p*H of alkaline plating solutions, to realize that much important work has originated on the other side. It is true that a large portion of American plating research has been devoted to process development and hence given the most spectacular results, but it is equally true that American developments would have come much more slowly had results of foreign fundamental research been unavailable. The present research program of the American Electroplaters' Society testifies to our appreciation of the necessity for basic research.

The conference symposia deal with processes that at this time are in an exceptionally fluid state: mechanical finishing and other smoothing processes, and electroforming, including the graphic arts. Great strides have already been made in these fields. Low-cost, high-quality production is part of the answer to the world's needs, and one may expect that this conference will contribute its share of new knowledge, that in time will make this planet a better place to live for all its inhabitants.

Gustaf Soderberg

THIS ARTICLE

. . . has been prepared from Set-up Instructions for Polishing and Buffing Wheels, issued and kindly put at "Plating's" disposal by the Manufacturing Department of General Motors Overseas Operations, Detroit, Michigan. It serves as an introduction to the picture story which follows.

MATERIALS USED IN POLISHING AND BUFFING

Wheels for Polishing

A polishing wheel is made by glueing together several buff sections which in turn are made from layers of cloth held together by sewing. The type of sewing found to be most generally used is in the form of a spiral, the spacing of which is usually $\frac{1}{4}$, $\frac{3}{8}$, or $\frac{1}{2}$ inch. This spacing determines the flexibility: the closer the sewing, the harder the finished wheel.

The layers, or plies, of which there are about 18 to 25 to a buff, are made from unbleached cotton cloth (sheeting). Two factors determine the quality of the cloth. One is the tightness of the weave, i. e., the number of strands per inch in each direction. A cloth quite suitable for the work under consideration would have an 84 x 92 count (the number of warp yarns and filling yarns per inch). The other quality factor is the length of the staple from which the yarn is made.

Depending on the desired width of the polishing wheel, several $\frac{1}{8}$-$\frac{1}{2}$ inch thick buff sections are used, as will be discussed later.

In view of the extended use of industrial fabrics, it is only natural that refined methods of testing and specifications are available for determination of their physical qualities. Since they are not within the scope of this discussion, it is suggested that, if the necessity arises, the reader consult other publications[1].

However, certain quality tests can be made without the use of expensive equipment. To insure value a count of the number of strands per inch should be made. From time to time a check should be made to determine the moisture contents of buffs, particularly if they are bought by the pound. To carry out this test, the buff should be weighed upon arrival, stored at elevated temperature, and weighed again. The differential in weight may be considerable. A rapid orientation regarding the care that was taken in manufacturing a buff can be had by taking it apart, examining all layers carefully. Usually an inspection like this will give an answer to premature wheel failure.

Buffs for Buffing

Basically, this buff is similar in construction to the ones used in polishing operations. To achieve the required finish, various designs or sewings are available.

For fast cut-down buffing, sewed buffs are in common use. Full-disc sections of cloth made from high-count sheeting are sewed spirally, concentrically, radially, in a square pattern, or in a crescent pattern from center to edge. The closer the rows of sewing, the denser the buff. Each type of sewing shows distinct advantages for specific applications.

Pocketed or folded buffs with interlocking-sections are suited for fast cutting with high flexibility. These buffs are made by taking long strips of cloth shirred in on one end and sewed to a hard center to cause folds to form radially. Often the cloth is cut or woven on the bias whereby wear due to fraying is minimized. Additional ventilation is provided by metal centers so designed as to throw air from the center to the periphery through the folds of the buff.

Loose buffs are used where flexibility is desired and fast cutting not necessary, such as in a final coloring operation. Cloth used for this operation may be made from sheeting with lower count (68 x 68 or 64 x 68).

The types of buff most generally used throughout General Motors Corporation have to meet certain

[1] "Handbook of Industrial Fabrics", 3rd or later ed., Wellington Sears Company, 15 Worth Street, New York, N. Y. "A.S.T.M. Standards on Textile Materials", American Society for Testing Materials, Philadelphia 3, Pa.

GENERAL MOTORS STANDARDS FOR COTTON BUFFS

(November, 1944)

Bias Cut Loose Buffs—G. M. 1602-M

Size of Buff: This type of buff may be purchased in 4, 5, 6, 7, 8, 10, 12, 14, 16, 17, 18, and 20 inch diameters. Thickness of ply to be specified on purchase order.

Material: New unbleached cotton cloth having 84/92 thread count, 40 inches wide; $3\frac{1}{4}$ yards shall weigh 1 lb or more.

Construction: Cloth to be bias cut and laid.

Sewing: Loose.

Scope of Specification:* While this specification should be considered in part as a guide to the vendor in the production of an acceptable product, it is not intended to relieve him of the responsibility of supplying material suitable for the specified use even though the desired qualities or limits are not stated in this specification.

Arbor Hole:* Size of arbor hole to be specified on purchase order.

Balance:* Each section shall be balanced and faced, ready for use.

Packing and Shipping:* To be agreed upon by purchaser and vendor, but arrangements must include proper markings of packages to show material-specification number and name, purchase-order number, and quantity.

Inspection and Rejection:* While samples may be taken from incoming shipments and checked according to this specification, the vendor must accept the responsibility of shipments meeting this specification without dependence upon the buyer's inspection, which may be done at his option.

Materials failing to conform shall be returned for credit or replacement, or other arrangements may be made at the option of the purchaser.

New Sources:* No shipments shall be made by new sources until a sample of what they propose to supply under this specification has been approved by the purchaser.

Unbleached Pieced Buffs—Full Sewed—G. M. 1604-M

Size of Buff: This type of buff may be purchased in 4, 5, 6, 7, 8, 10, 12, 14, 16, 17, 18 and 20 inch diameters. Thickness of ply to be specified on purchase order.

Material: New unbleached cotton cloth remnants having a 64/68 thread count or better, 36 inches wide; $3\frac{1}{2}$ yards shall weigh 1 lb or more.

Construction: Book laid. The strips and pieces used shall in no case be less than 6 inches long by the width of the cloth. Each layer of pieces to be crossed at right angles.

Reinforcement: Center of buff to be reinforced with cardboard or other suitable material, either a disc approximately 4 inches in diameter or a 4-inch square.

Sewing: Starting within $\frac{1}{4}$ inch of the periphery of the buff, it shall be sewed spirally $\frac{1}{4}$ inch, $\frac{3}{8}$ inch or $\frac{1}{2}$ inch between rows to within $\frac{1}{4}$ inch of the arbor hole, stitches to be approximately 7 per inch. (Purchase order must specify sewing.)

Full Disc Buffs—Full Spiral Sewed—G. M. 1611-M

Size of Buff: This type of buff may be purchased in 4, 5, 6, 7, 8, 10, 12, 14, 16, 17, 18 and 20 inch diameters. Thickness of ply to be specified on purchase order.

Material: New unbleached cotton cloth having 64/68 thread count, 36 inches wide; $3\frac{1}{2}$ yards shall weigh 1 lb or more.

Construction: Full disc. Every three plies to be turned approximately $\frac{1}{8}$ of the circumference of a circle.

Sewing: Starting at within $\frac{1}{4}$ inch of the periphery of the buff, it shall be sewed spirally $\frac{3}{8}$ inch between rows 6 stitches per inch, to within $\frac{1}{4}$ inch of the arbor hole.

Full Disc Buffs—Spoke Sewed—G. M. 1615-M

Size of Buff: This type of buff may be purchased in 4, 5, 6, 7, 8, 10, 12, 14, 16, 17, 18 and 20 inch diameters. Thickness of ply to be specified on purchase order.

Material: New unbleached cotton cloth, having a 64/68 thread count, 36 inches wide or 68/68 thread count, 40 inches wide; $3\frac{1}{2}$ yards of the former or $3\frac{1}{4}$ yards of the latter shall weigh 1 lb or more.

Construction: Full disc. Every three plies to be turned approximately $\frac{1}{8}$ of the circumference of a circle.

Sewing: One row of concentric sewing around arbor hole, also 4, 8, 12, 16, 24, 32 or 40 radial, arc or crescent sewings from a point $4\frac{1}{2}$ inches from the center hole of buff to the periphery, the distance between sewings to be approximately equal and stitches approximately 7 per inch. (Purchase order must specify type of sewing required.)

Full Disc Loose Buffs—Sewed Once—G. M. 1616-M

Size of Buff: This type of buff may be purchased in 4, 5, 6, 7, 8, 10, 12, 14, 16, 17, 18 and 20 inch diameters. Thickness of ply to be specified on purchase order.

Material: New unbleached cotton cloth, having a 64/68 thread count, 36 inches wide or 68/68 thread count, 40 inches wide; $3\frac{1}{2}$ yards of the former or $3\frac{1}{4}$ yards of the latter shall weigh 1 lb or more.

Construction: Full disc. Every two plies to be turned approximately $\frac{1}{8}$ of the circumference of a circle.

Sewing: One row of concentric sewing approximately one inch from the center of the arbor hole.

Full Disc Buffs—Partially Spiral Sewed—G. M. 1618-M

Size of Buff: This type of buff may be purchased in 8, 10, 12, 14, 16, 17, 18 and 20 inch diameters. Thickness of ply to be specified on purchase order.

Material: New unbleached cotton cloth, having a 64/68 thread count, 36 inches wide or 64/68 thread count, 40 inches wide; $3\frac{1}{2}$ yards of the former or $3\frac{1}{4}$ yards of the latter shall weigh 1 lb or more.

Construction: Full disc. Every three plies to be turned approximately $\frac{1}{8}$ of the circumference of a circle.

Sewing: One row of concentric sewing approximately $1\frac{1}{2}$ inches from the center of the arbor hole. Spiral sewed $\frac{3}{8}$ inch between rows starting at within $\frac{1}{4}$ inch of the periphery of the buff to a point $4\frac{1}{4}$ inches from the center of the arbor hole, stitches to be approximately 7 per inch.

Colored Pieced Buffs—Full Spiral Sewed—G. M. 1623-M

Size of Buff: This type of buff may be purchased in 14, 16, 17, 18 and 20 inch diameters. Thickness of ply to be specified on purchase order.

Material: New cotton cloth remnants, colored, bleached or unbleached, having a 64/64 thread count or better.

Construction: Book laid. The strips and pieces used shall in no case be less than 6 inches long by the width of the cloth. Each layer of pieces to be crossed at right angles.

Reinforcement: Center of buff to be reinforced with cardboard or other suitable material, either a disc approximately 4 inches in diameter or a 4-inch square.

Sewing: Starting within $\frac{1}{4}$ inch of the periphery of the buff, it shall be sewed spirally $\frac{1}{4}$ inch, $\frac{3}{8}$ inch, or $\frac{1}{2}$ inch between rows to within $\frac{1}{4}$ inch of the arbor hole. (Purchase order must specify sewing.)

*These clauses appear in all buff standards that follow but have not been repeated there.

GENERAL MOTORS STANDARDS FOR COTTON BUFFS

(Continued)

FULL DISC BUFFS—FOLDED INTERLOCKING SECTIONS—G. M. 1624-M

Size of Buff: This type of buff may be purchased in 10, 12, 14, 16 and 17 inch diameters. Thickness of ply to be specified on purchase order.

Material: New unbleached cotton sheeting having 64/68 thread count, 36 inches wide or 68/68 thread count, 40 inches wide; $3\frac{1}{2}$ yards of the former or $3\frac{1}{4}$ yards of the latter shall weigh 1 lb or more.

Construction: 18 full discs of which 16 are folded and interlocked; also 34 full discs of which 32 are folded and interlocked. (Type must be specified on purchase order.)

Sewing: Starting $\frac{1}{2}$ inch from arbor hole, four rows of $\frac{1}{4}$-inch spaced spiral stitching advancing to 6-inch diameters, stitches to be approximately 7 per inch.

FULL DISC BUFFS—FOLDED INTERLOCKING SECTIONS—G. M. 1625-M

Size of Buff: This type of buff may be purchased in 10, 12, 14, 16, or 17 inch diameters. Thickness of ply to be specified on purchase order.

Material: New unbleached cotton sheeting having 84-92 thread count, 40 inches wide; $3\frac{1}{4}$ yards shall weight 1 lb or more.

Sewing: Starting $\frac{1}{2}$ inch from arbor hole, four rows of $\frac{1}{8}$-inch spaced spiral stitching advancing to 6-inch diameter, stitches to be approximately 7 per inch.

FULL SPIRAL SEWED BLEACHED PIECED BUFFS—G. M. 1626-M

Size of Buff: This type of buff may be purchased in 4, 5, 6, 7, 8, 10, 12, 14, 17, 18 and 20 inch diameters. Thickness of ply to be specified on purchase order.

Material: New unbleached cotton cloth having 64/68 thread count or better, 36 inches wide; $3\frac{1}{2}$ yards shall weigh 1 lb or more.

Construction: Pieced and sewed. Fifty per cent of the buff shall consist of 80 per cent full-disc area.

Sewing: Starting at within $\frac{1}{4}$ inch of the periphery of the buff, it shall be sewed spirally $\frac{1}{4}$ inch between rows, approximately 6 stitches per inch, to within $\frac{1}{8}$ inch of arbor hole and concentric with hole.

standards[2]. Since these standards might serve as a guide when material is being ordered, they are included here.

DESCRIPTION OF BUFFS

The following types of buffs are representative.

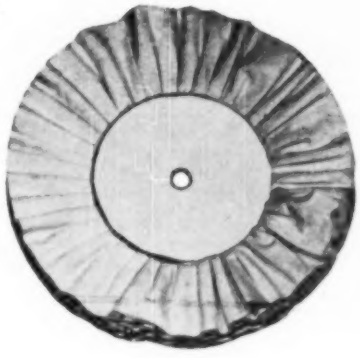
1. In the "Bias" type construction every thread stands at approximately 45 degrees to the circumference, whereby raveling and waste is said to be entirely eliminated. The puckered or pocket face created by the pleating keeps a flow of air in circulation, holds the compound, and produces a fast cross-cutting action. The center of the buff is made from cardboard. This buff is suited for hand- or automatic-machine-buffing operations.

2. The Spiral type of sewed buff is one of the oldest and most generally used buffs. Density or hardness is controlled by the width of space between the spiral stitching. This buff is used for hand, as well as automatic, polishing and is the type covered in the ensuing instructions.

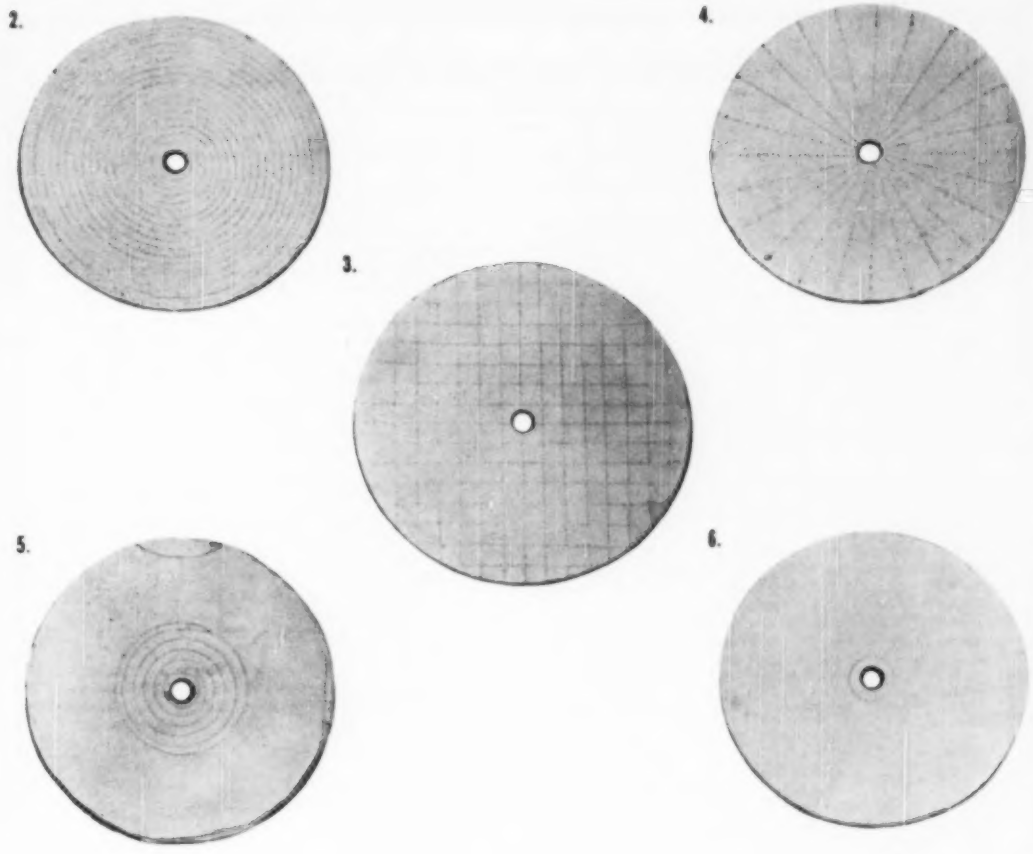
3. The stitches of the Square Sewed buff running out to the edge effect an even, uniform buff face. The work is furnished at all times with a soft, pliable face free from soft or hard spots. Where stitching is presented, it is always at right angles to the work.

4. The Sun Ray buff is a fast-cutting tool because the pockets formed by the sewing collect and hold the buffing compound. The more pockets, the harder the buff and the faster the cut.

1.



[2]The "G. M. Standards" referred to herein include two publications issued by the G. M. Central Office—Production Engineering Section: G. M. Materials and Processes Book (formerly Vol. II); G. M. Equipment and Operations Book (formerly Vol. III).



5. To make a "Triplex" Pocket buff, full discs are folded into segments and assembled radially with interlocking folds. Covers of full discs are applied, and the buff is assembled by spiral sewing around the arbor hole. This buff is used for hand, as well as automatic, buffing and is covered in the ensuing instructions.

6. Frequently used is the Full-Disc Loose buff. Each disc is a single piece of new sheeting. Usually 20 layers or discs are assembled into a section. Such an assembly, held together by one row of sewing close to the arbor hole, is known as a "full-disc buff, 20 ply, sewed once". Each two plies are turned slightly so that the threads are at an angle to the threads of the adjacent ply. This buff is used for hand buffing.

Abrasive Coating for Polishing Wheels

The abrasive commonly used is fused aluminum oxide. It is manufactured in high-temperature electric furnaces from bauxite. While the processing of the abrasive is outside the scope of this discussion, certain considerations are of interest here. The user of abrasive grain should in his own interest make a periodic check on the grain size. No commercially produced abrasive grain is composed 100 per cent of grains having the same average diameter. The irregular shape of the grain and variations in the screen cloth result in sizes that are made up from "oversize", "nominal" and "undersize". The "nominal" is the control product. A table of allowable limits for size of loose abrasive grain is found in a GM Standard, GM 1272-M, shown here.

It is essential that the purchaser insist on dust-free merchandise because dust adversely affects the grain-bonding operations.

Measurements of capillarity of aluminum oxide abrasives are described in the same standard. Capillarity is a measure of "wettability" of the grain. Grain of a low capillarity is difficult to wet with the bonding agent (adhesive cement) and hence gives a poor wheel head which will wear rapidly. High-capillarity grains make stronger heads because each grain is held as securely as its neighbor.

When grain is stored, containers should be kept closed to prevent loss of capillarity. In many polishing rooms one of the main factors contributing to low efficiency is that the need for high capillarity is not sufficiently recognized.

GENERAL MOTORS STANDARDS FOR LOOSE, ABRASIVE GRAIN (NATURAL OR ARTIFICIAL)

G.M. 4272-M (October, 1947)*

General: This specification covers abrasive grain or grit used for grinding-wheel bone or "stone" manufacture and for grinding, lapping, polishing, or buffing purposes.

Components: The loose abrasive grain may be of aluminum oxide, silicon carbide, emery, or other natural or artificial type, as called for by purchase order or contract.

Physical Properties: The allowable limits for the sizing of abrasive grain (according to Simplified Practice Recommendation R118-45) are set forth in Table I.

Tests: The following is an example of the use of the table:

Taking grit No. 10, all material must pass through the coarsest sieve, in this case the No. 7. Through the next to the coarsest sieve, termed the "control sieve", in this case the No. 8, all material may pass, but not more than 15 per cent may be retained on it. At least 45 per cent must pass through No. 8, the control sieve, and be retained on No. 10 sieve, but it is permissible to have 100 per cent pass through No. 8, the control sieve, and remain on No. 10 sieve, the requirement being that the grain passing through No. 8, the control sieve, and retained on No. 10 and No. 12 must add to at least 80 per cent. Consequently, if 45 per cent passed through No. 8 sieve, the control, and was retained on No. 10 sieve, then at least 35 per cent must be retained on the No. 12 sieve. There is no requirement for material retained on the finest sieve, in this case the No. 14 sieve, but not more than 3 per cent is permitted to pass through the No. 14 sieve.

*The specifications are given without considering whether patents may or may not be involved. In all cases, therefore, the supplier is required to assume patent liability.

Method of Calibration of Sieves

1. The sieves shall be certified by the United States Bureau of Standards and shall conform to the set of master sieves developed for the abrasive industry by the Technical Committee of Producers of Electric Furnace Abrasives.

2. Master samples as of February, 1931, approved by T.C.P.E.F.A., shall be used to calibrate said sieves.

3. One hundred grams shall be taken from a fair-sized sample which includes grain taken from top, center, and bottom of keg or other container, properly quartered.

4. The one hundred grams shall be placed on the coarsest sieve in the series for the size to be checked and run on a Rotap testing machine operated at 156 taps per minute.

5. The time of test shall be five minutes, plus or minus three seconds.

6. The residue on sieves after Rotap operation shall be weighed and the results compiled to compare with results obtained from the master sample tested in the like manner.

7. Sieves shall be repaired or replaced when they fail to give satisfactory calibration with the master samples according to the procedure outlined in the following paragraph.

8. (a) Any sieve shall be considered unsatisfactory when used as a control sieve if the result obtained on a 100 gram sample differs by more than plus or minus 5 grams from the official analysis of the master sample.

TABLE I. ALLOWABLE LIMITS FOR SIZING OF ABRASIVE GRAIN

Grit No.	No. Sieve through which 100% must pass	Control Sieve		Maximum Oversize Retained on Control Sieve per cent	Minimum through Control Sieve and Retained		Cumulative Minimum through Control Sieve and Retained		Maximum of 3% through Sieve No.
		No.	Opening		per cent	on Sieve No.	per cent	on Sieve No.	
10	7	8	0.0937	15	45	10	80	10,12	14
12	8	10	0.0787	15	45	12	80	12,14	16
14	10	12	0.0661	15	45	14	80	14,16	18
16	12	14	0.0555	15	45	16	80	16,18	20
20	14	16	0.0469	15	45	18	80	18,20	25
24	16	20	0.0331	20	45	25	75	25,30	35
30	18	25	0.0280	20	45	30	75	30,35	40
36	20	30	0.0232	20	45	35	75	35,40	45
46	30	40	0.0165	30	45	45	65	45,50	60
54	35	45	0.0138	20	45	50	75	50,60	70
60	40	50	0.0117	30	45	60	65	60,70	80
70	50	60	0.0098	15	45	70	70	70,80	100
80	60	70	0.0083	15	40	80	70	80,100	120
90	70	80	0.0070	15	40	100	70	100,120	140
100	80	100	0.0059	15	40	120	65	120,140	200
120	100	120	0.0049	15	30	140	60	140,170	230
150	100	140	0.0041	15	40	170,200	75	170,200,230	270
180	120	170	0.0035	15	40	200,230	65	200,230,270	
220	140	200	0.0029	15	40	230,270	60	230,270,325	
240	170	200	0.0029	5	8	230,270	38	230,270,325	

GENERAL MOTORS STANDARDS FOR ABRASIVE GRAIN

(Continued)

(b) Any sieve shall be considered unsatisfactory when used as a major sieve when the result obtained on a 100 gram sample differs by more than plus or minus 10 grams from the official analysis given for the master sample.

Standardization of Abrasive Flours (finer than No. 240): The most practical method of measuring fine grain sizes is to average the two largest dimensions based on microscopic examination.

Grain sizes should first be separated either by the sedimentation process or by a Roller Air Analyzer. The grain sizes are then determined by microscopic examination.

"Average grain size" is indicated by having at least 50 per cent of the grit being examined come in that size category, as shown by the graph below.

The No. 240 grain is shown dotted as it is specified by sieve test and is shown here to establish its relation to No. 280 flour.

The No. 280 flour shall have an average grain size of 60 microns. The bulk of the grains shall fall within the 38–73 micron range.

The No. 320 flour shall have an average grain size of 45 microns. The bulk of the grains shall fall within the 25–55 micron range.

The No. 400 flour shall have an average grain size of 32 microns. The bulk of the grains shall fall within the 15–42 micron range.

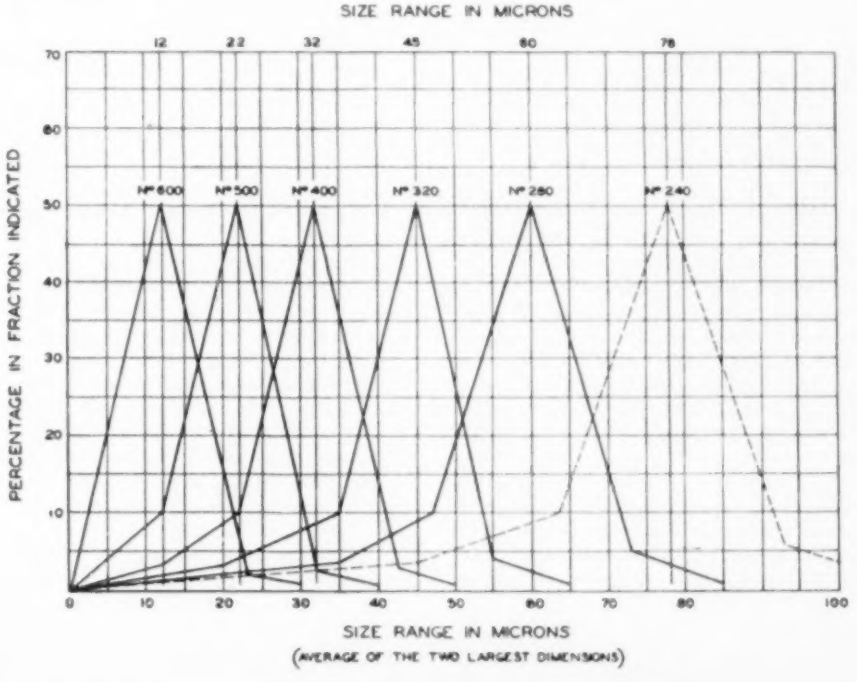
The No. 500 flour shall have an average grain size of 22 microns. The bulk of the grains shall fall within the 6–32 micron range.

The No. 600 flour shall have an average grain size of 12 microns. The bulk of the grains shall fall within the 0–23 micron range.

In the flour sizes there are often oversize "stragglers" or "slivers" which cannot be eliminated by any method. These stragglers or slivers float in either an air circuit or in a liquid along with the more uniform grains of smaller volume. They do not cause much trouble, eventually breaking up into smaller particles. It is necessary to allow approximately ½ per cent when determining grain size. For example, a grain measuring 20 x 20 x 30 microns would be designated as having an average grain size of 25 microns and a volume of 12,000 cubic microns. In this range it may be possible to have a straggler or sliver 90 microns long x 30 microns wide with an average thickness of 4 microns. This straggler or sliver would be designated as having an average grain size of 60 microns and a volume of 10,800 cubic microns.

It should be noted that there is a progressive step-up between the sizes, and that all sizes start at 0 micron with a gap of ½ per cent left at the high side for the oversized stragglers or slivers.

Capillarity Test of Electrically Fused Aluminum Oxide Abrasives for Polishing Uses: Capillary attraction of abrasive grain is that property of attracting water so that the surfaces of the grain particles are thoroughly wetted. This is essential to all kinds of abrasive grain that are to be used in conjunction with glue such as in setting up metal polishing wheels. Foreign matter on the grain surface that is repellent to water would result in poor bonding between the grain particles and the glue; therefore, the grains must be prepared so that the glue will not only spread easily on the surface of the particles but also thoroughly after the bond has set. Such grain should be maintained in use free from work dust, fumes, oil, grease, and other organic materials, etc., which are



GENERAL MOTORS STANDARDS FOR ABRASIVE GRAIN

(Continued)

water repellent and destroy capillarity. In order to measure capillarity the following standard method with minimum limits has been developed.

Apparatus

The apparatus used for making capillarity tests is a stand designed to hold glass tubes in a vertical position with the tubes resting in a shallow pan.

The glass tubes are 25 cm long and 5 mm inside diameter, uniform bore. (Apparatus can be purchased from Central Scientific Company, Chicago by specifying S.O.M. 8164.)

Method

A representative sample should be taken from the original container by any approved sampling method. Care should be exercised in taking and handling this sample to prevent contamination. Such contamination may be caused by contact with hands or any unclean containers. It is recommended that samples be handled in clean sealed glass containers.

Place a clean tube in the stand, and fill the tube with sample. The tube is carefully tapped with a pencil at the middle of the tube until there is no further settling of the grain. Distilled water 65-75° F is poured into the pan of the stand to a depth of 1 cm. Reading time is started as soon as the water is added. At end of specified time interval for each grit number a reading is made of the height of water rise in the tube above the water level in the pan, without disturbing the tube. The height of rise in centimeters constitutes the capillarity of the grain.

The required minimum capillarity is shown in Table II.

Cleaning of Tubes

After washing the grain from the tubes, the tubes should stand immersed in a cleaning solution (a concentrated solution of potassium bichromate in concentrated sulfuric acid) while not in use. As needed, they should be rinsed in distilled water and dried in a drying oven, then cooled to room temperature. No tube should be used for more than one test without cleaning.

TABLE II. MINIMUM CAPILLARITY OF ELECTRICALLY FUSED ALUMINUM OXIDE ABRASIVES

Grit No.	Time minutes	Rise cm
38	2	5.5
46	2	6.5
54	2	7.3
60	2	8.5
70	5	13
80	5	14
90	5	14
100	5	14
120	5	14
150	5	12.5
180	5	11
220	5	10
240	5	10

Packing and Marking: This material must be packed in suitable containers as specified on purchase order. Containers shall be marked with vendor's name and address, General Motors material-specification number and name, purchase-order number, and net weight.

Inspection and Rejection: While samples may be taken from incoming shipments and checked according to this specification, the vendor must accept the responsibility of shipments' meeting this specification without dependence upon the purchaser's inspection, which may be done at his option.

Materials failing to conform shall be returned for credit or replacement, or other arrangements may be made at the option of the purchaser.

New Sources: No shipment shall be made by a new source until a sample of the material it proposes to supply under this specification has been approved by the purchaser's laboratory.

Bonding Agents

Adhesive Cements.—Sodium silicate-base cements have, in recent years, captured a large field of application previously held by glues. Advantages when using cement are many. They may be employed at room temperatures as received from the manufacturer, eliminating special equipment. A cement-bonded wheel will stand higher temperatures in drying as well as in use.

The cements are made in a number of grades to suit work on different metals, various flexibilities and drying-temperature conditions. Good materials are stable and will not deteriorate, thicken or settle. They freeze at very low temperatures but are in no way harmed by freezing. They do not soften under pressure or heat of polishing. They should be stored in covered containers to avoid contamination. Brushes or containers can be cleaned easily with water.

Several companies manufacture proprietary mixtures of silicate-base cements. Since the success of their products depends almost wholly upon close adherence to instructions, no attempt will be made here to set any general rules to cover them.

Animal Glue.—For very fine polishing operations a good many operators prefer hide glue. Whether a cement-type bonding agent or hide glue is used does not affect the number, or sequence, of operations required to make a polishing wheel.

(*To be continued in a future issue*)

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W. R. MEYER

DR. WALTER R. MEYER has the distinction of being both an able scientist and a successful businessman, a very effective combination in a rapidly changing field like the plating field.

He was born on October 15, 1906 in Meriden, Conn., but lived his early years on a farm and received his first schooling in Yalesville, Conn. Soon, however, the way led back to the city, to New Haven, Conn., where he spent a large part of his life.

Dr. Meyer is an alumnus of Yale University from which he received a B.S. degree in chemistry, magna cum laude. With it came the Yale prize for excellence in chemistry and a four-year scholarship. Studies of organic chemistry followed in the Graduate School but were broken off after two years on account of the depression. When he returned, he went to the Engineering School to study metallurgy. He earned a Ph.D. degree in 1938 with a thesis on the structure of electrodeposited copper alloys, presented as a paper before the American Electroplaters' Society and the First International Conference on Electrodeposition in London.

Dr. Meyer's industrial experience, which was later to guide his further studies, dates from 1930 when he began work in the plating room and as plant chemist for Sargent & Company, New Haven. Two years later he moved to the Bridgeport, Conn., plant of General Electric Company as electrochemist and metallurgist. The six years that followed gained him thorough experience in many fields of electroplating, and a study trip to Europe, in 1938, gave him a broad outlook on the whole field.

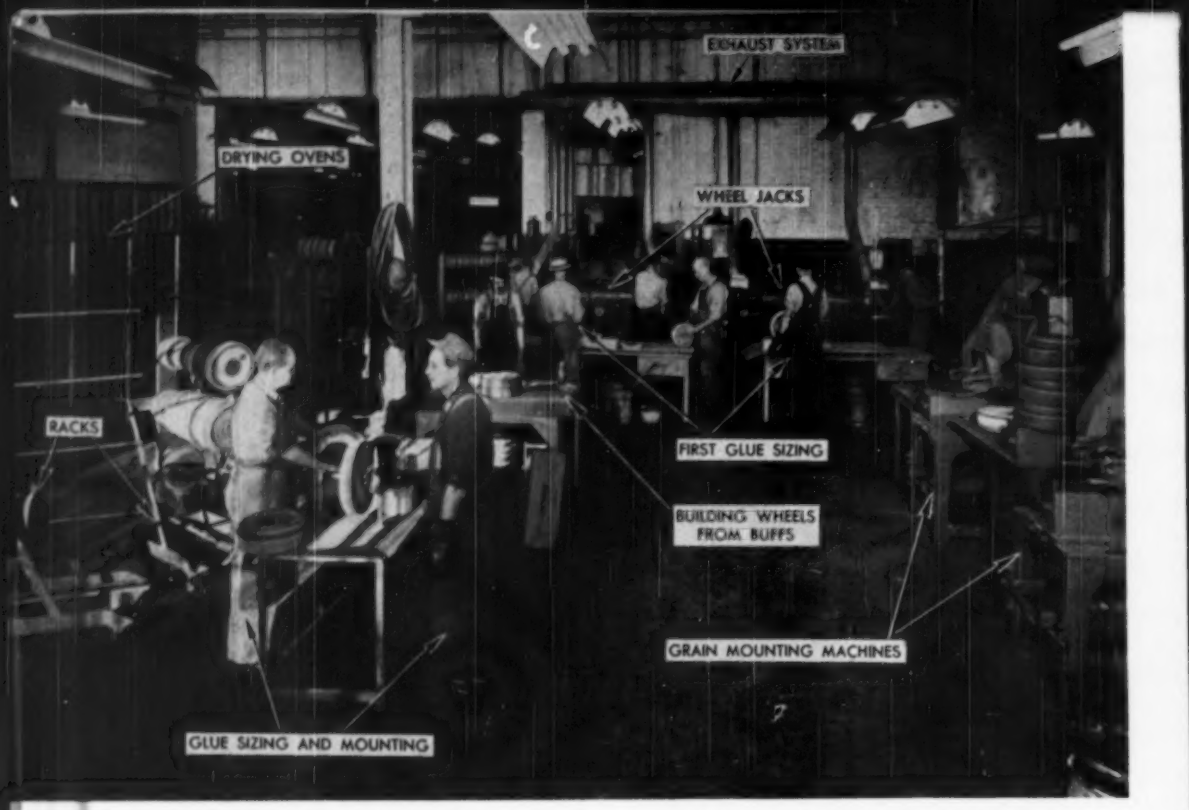
In the latter year, after his formal education had been completed, Dr. Meyer became the editor of Metal Industry (now Metal Finishing) and of Plating and Finishing Guide Book and during the next four years added greatly to the standing of these publications. In 1942 he joined Enthone, Inc., New Haven, Conn., which under his leadership as President-Technical Director has become an important supplier to the plating industry and known for the large number of specialties that it has put on the market.

A survey of the some 35 papers and articles published by Dr. Meyer and the several patents issued to him indicates his wide range of interests. A number of them deal with fundamental questions of deposit structure, adhesion, etc.; others show the scientific approach to purely practical problems of buffing, barrel burnishing, cleaning, bright dipping, coloring, and other surface treatments.

Dr. Meyer is a member of many technical societies, among them the Electrochemical Society, American Institute of Mining and Metallurgical Engineers, and the American Electroplaters' Society. He has been particularly active in the latter society. A popular speaker, he has visited more than three-fourths of its branches and delivers some ten talks each year. He is a member of A. E. S. Research Project Committee No. 2, and an associate editor of this journal.

Among honors that have come Dr. Meyer's way are membership in Sigma Xi and the Founders Gold Medal of the American Electroplaters' Society.

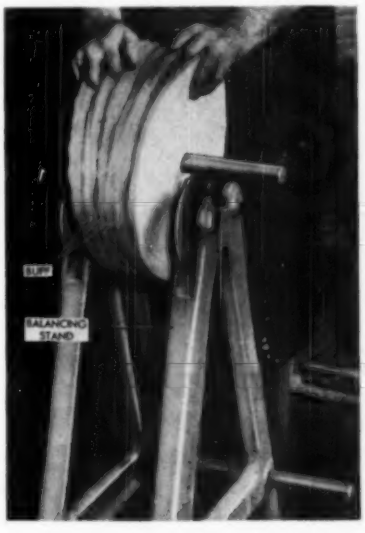
All who come in contact with Dr. Meyer appreciate his friendly interest in their problems and his willingness to contribute to their solution from his large fund of knowledge and experience.



A well laid-out and efficiently run wheel room. Note the good lighting and the cleanliness. The arbor press for mounting bushings and the table for fastening the bushings, shown hereinafter, are in the foreground but do not appear in the picture.

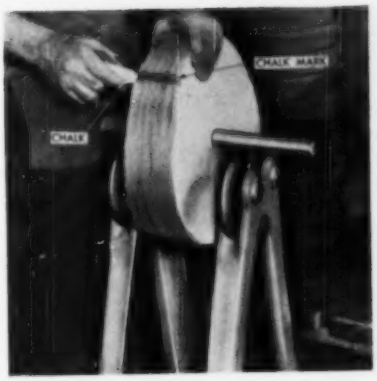
SETTING UP POLISHING WHEELS

The picture story presented here, like the preceding article, was prepared from Set-up Instructions for Polishing and Buffing Wheels, issued and kindly placed at "PLATING'S" disposal by the Manufacturing Department of General Motors Overseas Operations, Detroit, Michigan. It will be followed in a future issue by a description of how polishing wheels are put into operation, how used polishing wheels are reconditioned, and how buffs are prepared for buffing.

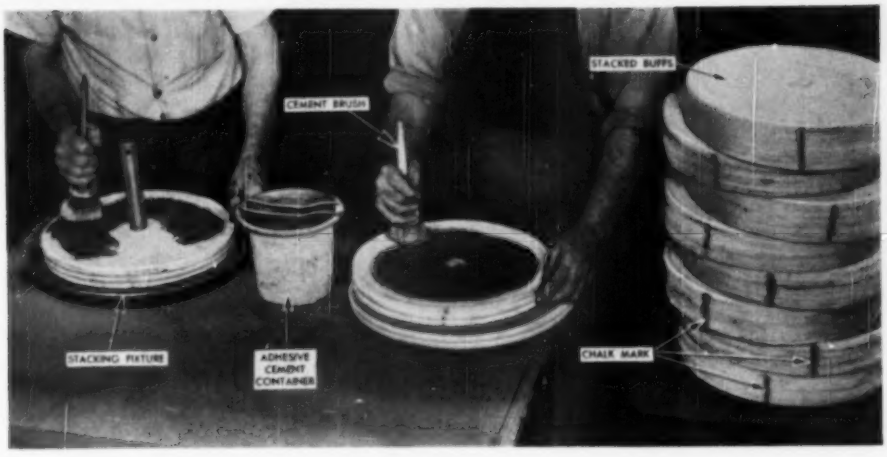


The necessary number of buffs have been assembled on a balancing shaft, supported by Sundstrand adjustable-stand Balancing Ways, and are being shifted with all fingers for static balance.

The future wheel is marked across the buffs to assure that they will be kept in static balance during bonding operation which follows.



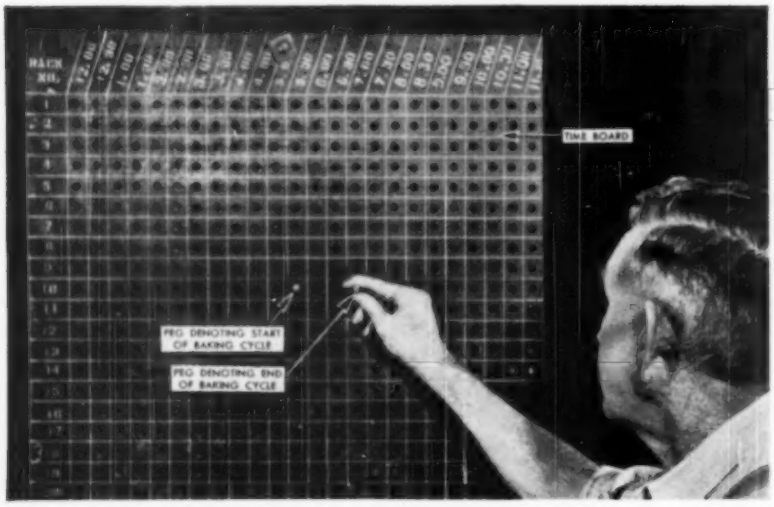
Man at right works unreduced cement from 8-inch high, 8-inch diameter steel pot into one side of buff with 2-inch glue brush, taking care not to spread the cement too close to arbor hole. The buff is then put upside down on fixture to the left where the other man coats the other side.



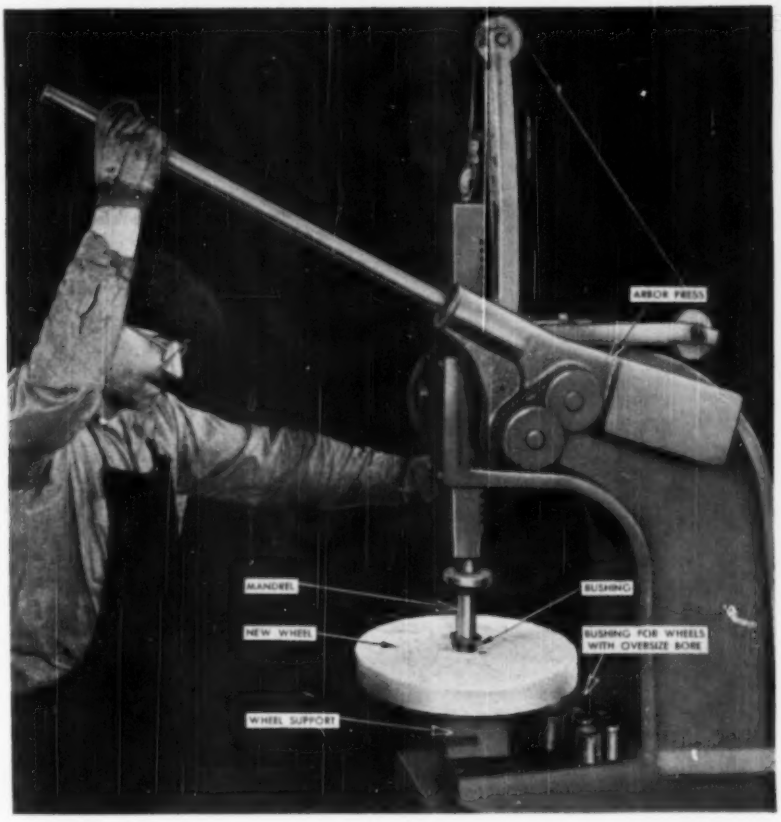
Man at left stacks buff coated on underside on top of previously coated buff, keeping chalk marks in line. Fixture base is 16-inch diameter, 15/16-inch thick; height to top of pin measures 10 inches

A number of wheels made from cemented buffs have been placed between sheet-metal dividers in a press with a 20-inch square, 7/8-inch thick bottom support. After the nut has been tightened to supply bonding pressure, the wheels are kept at room temperature for about 24 hours, allowing much moisture to escape prior to oven curing. The whole assembly is about $3\frac{1}{2}$ feet high.

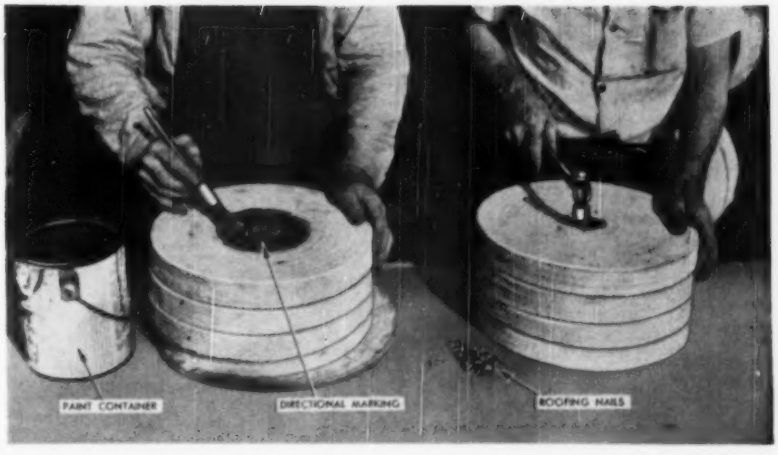
The air-dried wheels have been hung through their arbor holes on horizontal pins attached to caster-equipped racks. The racks are moved into the oven, the floor of which has channels to guide the casters. The transition from outside floor to channel is smooth. In the oven hot air of 160° F circulates freely for 24 hours around the spaced-apart wheels; they would steam themselves apart if no spacing had been allowed.



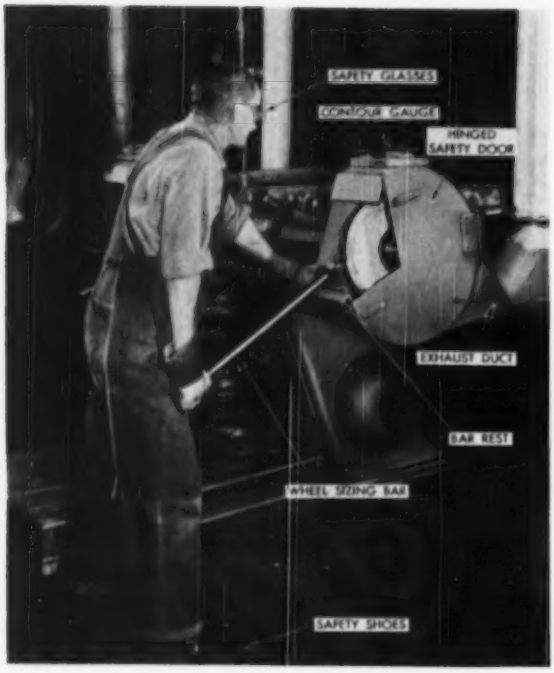
Each drying rack is numbered and represented by a peg on the timing board which makes possible proper cycling through the baking oven. A second peg is used for less than 24-hour baking required by abrasive coatings.



To reduce spindle wear and keep the wheel concentric, two bushings, which are standard items, are pushed into the arbor hole, one from each side. The mandrel, which has a tapered end, passes through the bushing to maintain axial alignment; when the flange touches the bushing, it will be forced into the wheel.



At right three standard large-head barbed galvanized roofing nails with diamond point, $1\frac{1}{2}$ inches long, are driven into the wheel through each bushing as a safety measure. The wheel is then turned over to the operator on the left who paints it on one side. The painted side is always kept to the polisher's right on the spindle to insure the same direction of rotation during the life of the wheel. Quite often a stencilled arrow is used instead as the directional marking.

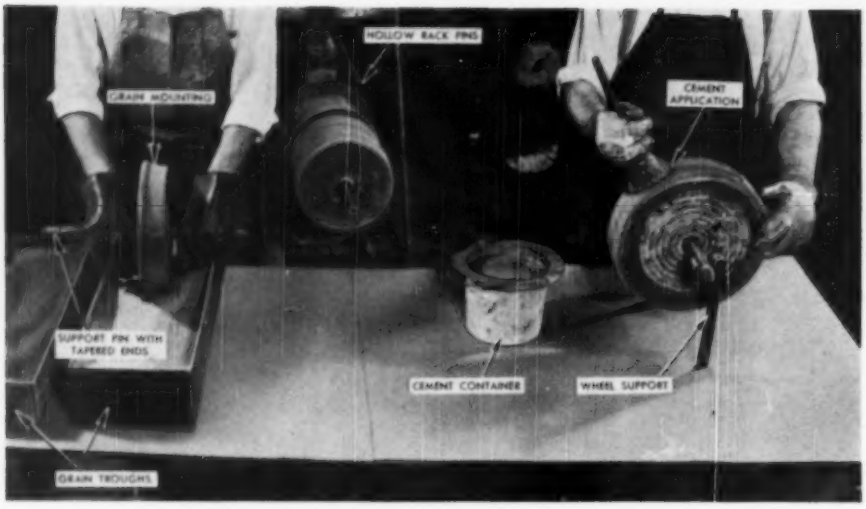


Here the periphery of the wheel is shaped at 3000 rpm to match the contour of the work piece to be polished, and the nap of the wheel is raised for cushioning effect and more positive bond between abrasive and cement. Singeing of the wheel fibers is strictly avoided, or the wheel becomes inoperative. The 40-inch long sizing bar, made of ¾-1-inch OD pipe sharpened at one end and covered with friction tape on the other, pivots on a sturdy rest, which is part of the wheel housing, while guided with both hands and supported against operator's right upper leg. Rotation of wheel makes it "run into" the bar. Gauges are used to guide the contouring. Note important safety features.

Straight wheels also need to have the nap raised. A short nap produces the best finish because a long nap cuts as a whip. The tool is a 12-inch long rake of ¾-inch lumber with a 3½ by 2¼-inch wide section studded with No. 2 common nails. The back is protected to prevent backing-up nail heads from injuring operator's hand. Note raking position of tool, the painted area on wheel on operator's right side regardless of whether wheel is mounted on left or right spindle, and safety baffle inside wheel housing immediately above exhaust duct which prevents objects from being carried back and injuring operator. Safety door, ¾ circular, is, of course, closed in actual operation.

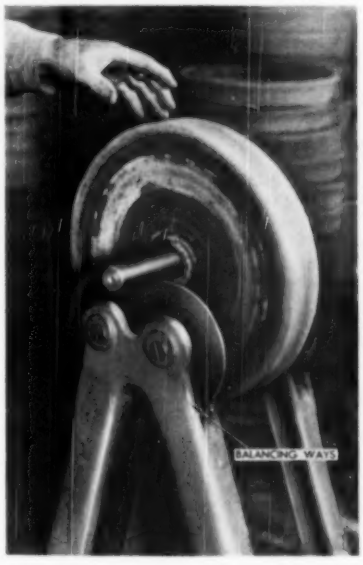
Final dressing is done with a carborundum stone (piece of emery wheel) to give polishing wheel a smooth coat. Note that stone is held so that wheel runs from it.

A preliminary coat of adhesive cement is required as foundation for subsequent grain coatings. After a 2:1 cement-water mixture from 24 by 9 by 8-inch steel trough has been well brushed into the face of the wheel, the workman turns it with his right hand while stroking it with his left to lay down the nap and remove excess cement. Note his rubber gloves which prevent skin irritation and the 3/8 x 1-inch steel supports bolted to table. The wheels are then given a short air dry, baked for 1–2 hours at 160° F well separated on racks in the oven with time controlled by means of the timing board, and allowed to cool completely to room temperature.

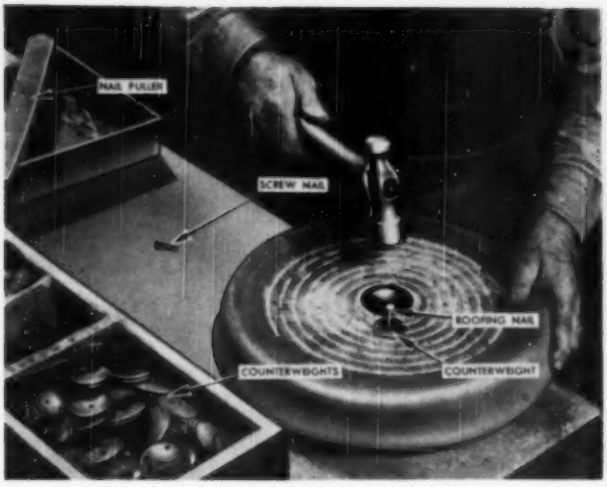


Three identical operations are used in mounting the "head". In each the man at right thoroughly brushes in unreduced cement, avoiding excesses which cause wrinkles in the coating with the finer grits, then transfers the wheel immediately to the man at left who with downward strokes rotates it through the abrasive grain until no cement can be seen and the wheel looks dry. The pressure used to pound the wheel in the grain determines the polishing action and must be uniform, a technique which can be acquired only with much practice. Grit numbers should be painted on troughs, which should be covered as much as possible to prevent contamination. Grain should be screened daily. Note tapered ends of men's support pins which engage with tubular rack pins to facilitate transfer of wheels.

When the three heading operations have been concluded, the wheels are put on racks and dried for three hours at 160° F in the oven, which must be equipped with air circulating equipment to insure proper removal of moisture. Here the operator pulls the hot rack out of the oven with a cool wire hook.



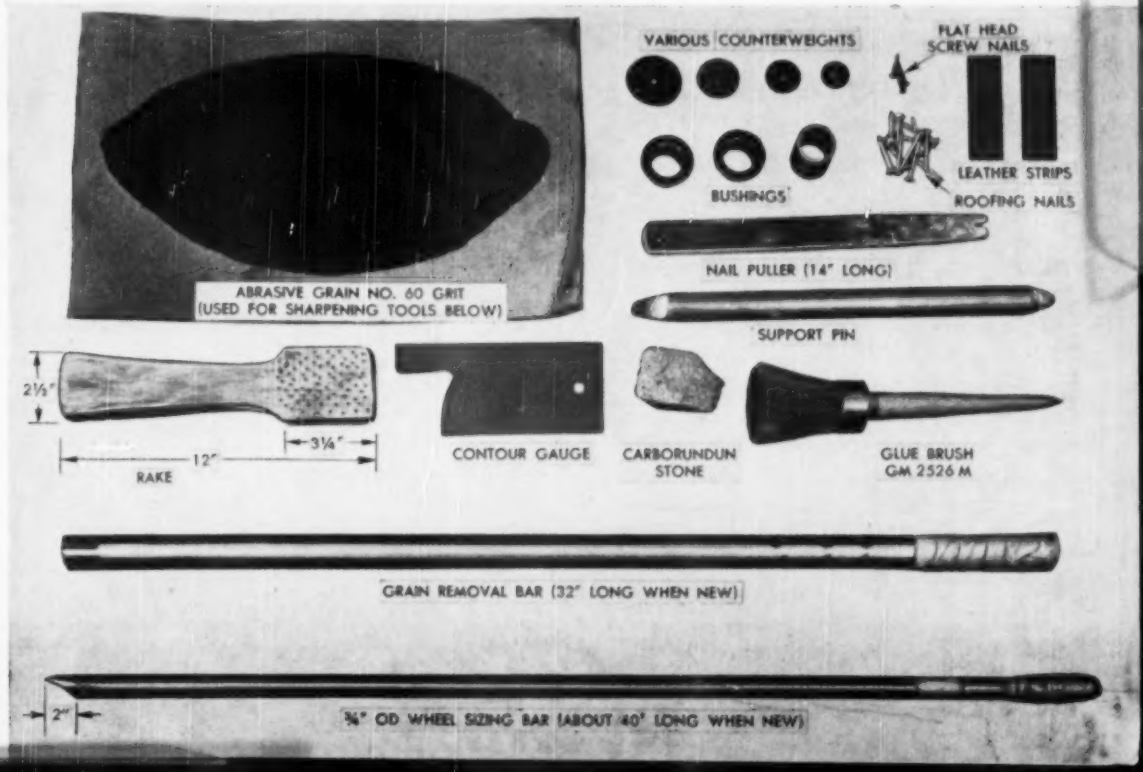
The balancing ways are used again, this time for the final static balancing necessary both with new and reworked wheels. The size and location of the counterweight is determined in this operation.



The dished counter weight made of 1/16-inch stock comes in 1-, 1½-, 1¼-, and 2-inch diameters. Single weights or combinations of several weights are fastened in one spot only, with one roofing nail in the center and two screw nails on the outside. A special nail puller is used to remove weights and nails when required.

The final operation, cracking of the wheel head, lends elasticity to the wheel and permits each grit particle to position itself for more efficient cutting. The wheel face is first struck at an angle of 45° with a piece of pipe, around the wheel once or twice. Then the pipe is held at 90° angle to its first position and the operation repeated once around the wheel.

Only simple tools are used in setting up polishing wheels. Wheels surfaced with No. 60 grit in the manner described are used to keep the sizing and cut-off tools in good condition.



ELECTROMETRIC SYSTEM FOR CONTINUOUS CONTROL OF REDUCTION OF HEXAVALENT CHROMIUM IN PLANT WASTES*

JAMES L. KELCH† AND A. KENNETH GRAHAM‡

The increasing public consciousness of the need for stream-pollution control creates many new and varied problems for manufacturers who use public streams in which to discharge plant wastes. The effluents from metal-finishing plants must ordinarily be treated to remove excess acidity or alkalinity, heavy metals, cyanides, and hexavalent chromium. A practical potentiometric method for continuous control of the reduction of hexavalent chromium to trivalent chromium with ferrous sulfate (copperas) in the presence of sulfuric acid is described in this paper.

SUMMARY

1. Continuous reduction of hexavalent chromium to trivalent chromium in plant-waste effluents by means of ferrous sulfate in acid solution is practicable and controllable.

2. The electrode system and controlling devices described here supply means for continuous control of the addition of reductant and acid to a flowing waste.

3. Ferrous sulfate in concentrations up to 12 16 oz/gal stabilized with sulfuric acid to a *p*H of 2.0 will reduce hexavalent chromium efficiently, provided enough free sulfuric acid or equivalent is present to insure a final solution *p*H of 2.5 or lower.

4. The potential of a platinum-calomel electrode system at which complete reduction of chromic acid in various concentrations may be assured is between 190 and 500 millivolts.

THEORETICAL ASPECTS

Hexavalent chromium in the form of chromic acid, normal chromate, or dichromate is reduced by ferrous sulfate according to one of the following oxidation-reduction equations:

(1) $2CrO_3 + 6FeSO_4 + 6H_2SO_4 = Cr_2(SO_4)_3 + 3Fe_2(SO_4)_3 + 6H_2O$

(2) $Na_2CrO_4 + H_2SO_4 = Na_2SO_4 + H_2CrO_4$
$2H_2CrO_4 + 6FeSO_4 + 6H_2SO_4 = Cr_2(SO_4)_3 + 3Fe_2(SO_4)_3 + 8H_2O$

(3) $Na_2Cr_2O_7 + H_2SO_4 = H_2Cr_2O_7 + Na_2SO_4$
$H_2Cr_2O_7 + 6FeSO_4 + 6H_2SO_4 = 3Fe_2(SO_4)_3 + Cr_2(SO_4)_3 + 7H_2O$

The following weight relationships are obtained from equation (1):

$2CrO_3$: $6FeSO_4$: $6H_2SO_4$: : 200: 912: 588: : 1: 4.55: 2.94

and

$2CrO_3$: $6FeSO_4 \cdot 7H_2O$: : 200: 1668: : 1: 8.34

Therefore,

(a) 8.34 weight units of $FeSO_4 \cdot 7H_2O$ are required to reduce one weight unit of CrO_3.

(b) 2.94 weight units of H_2SO_4 are required in the reduction of one weight unit of CrO_3. This quantity

*A contribution from the Standard Steel Spring Company, Newton Falls, Ohio.

†Chief Chemist, Newton Falls Division, Standard Steel Spring Company, Newton Falls, Ohio.

‡Consultant, Graham, Crowley & Associates, Inc., Jenkintown, Pa.

EDITOR'S NOTE: This article is limited to a description of a unique means of controlling the reduction of hexavalent chromium in a continuous stream of waste. The reader is cautioned that the reduced waste must always be further treated to adjust *p*H, precipitate heavy metal ions, remove solids, and meet such other requirements of local authorities as the biological oxygen demand of the plant effluent.

of H_2SO_4 is consumed in the reaction itself; in addition there must be present at the end of the reaction sufficient excess to maintain the solution at or below *p*H 2.5 so that the operation may be controlled by the electrode system described in this paper.

(c) One hundred pounds of CrO_3 in a waste effluent would require 834 pounds of $FeSO_4 \cdot 7H_2O$ and a minimum of 294 pounds of H_2SO_4 (100%) assuming complete reaction according to equation (1).

Experimental Data

An external electrode system consisting of calomel and platinum electrodes was used with a laboratory-model Beckman *p*H meter to study the oxidation-reduction potential when a weak acidified chromic acid solution is titrated with an acidified ferrous sulfate solution at room temperature.

Solutions were prepared to contain 10, 50, 100 and 200 ppm of CrO_3. Samples, 200 ml in volume, were then adjusted with sulfuric acid to *p*H 1.7. A 3 per cent solution of ferrous sulfate crystals containing sufficient sulfuric acid to give *p*H 2.0 was used for reduction. The ferrous sulfate solution was added in small increments from a burette with constant stirring, and the cell voltage was observed after a steady value had been reached. These data are recorded in the form of graphs in Fig. 1.

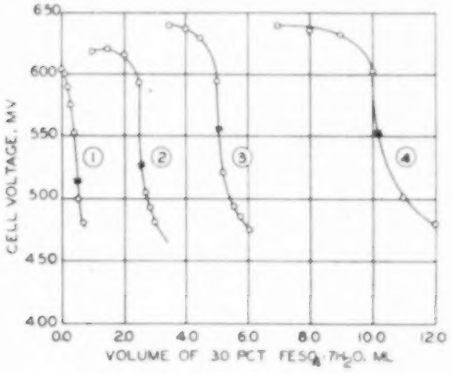


Fig. 1. Variation of cell voltage with chromic acid concentration on titration at room temperature with a 3.0 per cent $FeSO_4 \cdot 7H_2O$ solution of pH 2.0. Volume of CrO_3 samples, 200 ml; pH 1.7. Concentration of CrO_3 (1) 10 ppm, (2) 50 ppm, (3) 100 ppm, (4) 200 ppm. X are equivalence points by the method of second derivative

Referring to the latter, it should be noted that the cell voltage falls rapidly through the equivalence points X which were determined by the method of second derivatives and are recorded in Table I. The cell reading at the equivalence point was 517 mv for the sample containing 10 ppm of CrO_3 and increased to 552 mv for the sample containing 200 ppm of CrO_3. The weighted average reading was 549 mv. It should, therefore, be possible to use this electrode system both to indicate and to control the reduction of chromic acid in plant waste provided the setting on the potentiometer controller corresponds to a cell voltage of 490–500 mv which insures an excess ferrous sulfate concentration.

TABLE I. EFFECT OF CHROMIC ACID CONCENTRATION OF THE WASTE ON CELL READING AT EQUIVALENCE POINT IN TITRATION OF CHROMIC ACID WASTE

Waste Sample: 200 ml CrO_3 solution of *p*H 1.7
Titrant: 3 per cent $FeSO_4 \cdot 7H_2O$ solution of *p*H 2.0
Room Temperature

Chromic Acid ppm	Ferrous Sulfate Solution ml/100 ppm CrO_3	Cell Reading at Equivalence Point* mv
10	4.68	517
50	5.29	527
100	5.10	557
200	5.29	552
Weighted Average	5.19	549

*By method of second derivatives

The equations for the reduction of hexavalent chromium with ferrous sulfate indicate the necessity of having sufficient free acid to combine with the reaction products. The effect of *p*H on the cell voltage in the reduction of chromic acid was therefore investigated using a 3 per cent solution of ferrous sulfate crystals acidified with sulfuric acid to *p*H 2.0. Six samples, 200 ml in volume, each containing 100 ppm of CrO_3, were prepared and the *p*H adjusted to 1.4, 1.7, 2.0, 2.5, 3.0 and 5.0 respectively. The ferrous sulfate solution was again added in increments from a burette with constant stirring and the cell voltage observed after a steady value had been reached. These data are found in the curves in Fig. 2.

Referring to this figure, it should be noted that for an initial *p*H lower than 2.5 there is a sharp break in the curve when it passes through the equivalence points X, which have been calculated by the method of second derivatives and recorded in Table II. The equivalence point for the chromic acid sample having an initial *p*H of 1.4 corresponds to a cell reading of 603 mv. As the initial *p*H is increased to 2.5, cell reading at the equivalence point decreases to 506 mv. These data again indicate that a control setting on the potentiometer under 500 mv would insure complete reduction of chromic acid and an excess of ferrous sulfate, provided the final *p*H of the mixture is less than 2.5.

The chromic acid samples having an initial *p*H of 2.5 and higher contained a precipitate at the end of

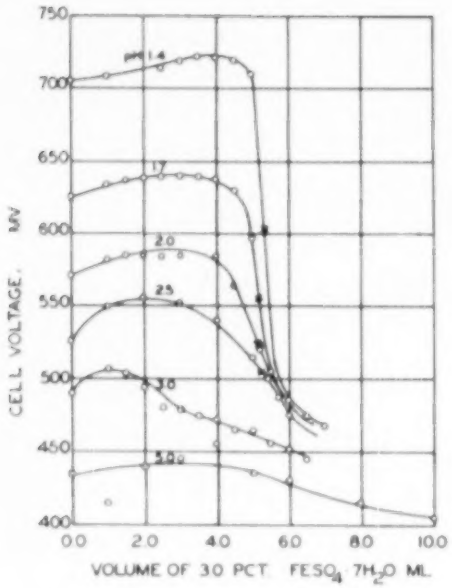


Fig. 2. Variation of cell voltage on titration at room temperature of 200-ml samples of 100-ppm CrO_3 having different initial pH values, with 3.0 per cent $FeSO_4$ $7H_2O$ solution of pH 2.0

the titration, indicating that the amount of free acid was insufficient. The precipitate caused fouling of the electrodes, and in the case of the 3.0 and 5.0 *p*H samples the curves show that the electrode performance is unsatisfactory for control of the reduction of chromic acid.

In Table III are recorded the equivalence points on titration of 200-ml samples of *p*H 2.0 and 2.5 containing 383 ppm of potassium chromate, equivalent to 200 ppm CrO_3, with 3.0 per cent $FeSO_4$ $7H_2O$ solution of *p*H 2.0. The acidified potassium chromate sample with initial *p*H of 2.0 gave a cell reading at the equivalence point of 508 mv. This is wholly consistent with the value obtained for the chromic acid sample of *p*H 2. However, the potassium chromate sample with an initial *p*H of 2.5 gave what appeared to be two equivalence points at cell readings of 514 and 168 mv. This irregular behavior was accompanied by the formation of a precipitate which is an indication that the final *p*H was too high and that the electrodes were not performing satisfactorily. It would appear that alkaline chromates can also be satisfactorily reduced with the system under discussion, provided there is sufficient free acid at the end of the reaction to correspond to *p*H less than 2.5.

Next were compared the performances of the cell when 6.0 and 3.0 per cent $FeSO_4$ $7H_2O$ solutions acidified to *p*H 2.0 were used for reduction. Samples of acid waste, 200 ml in volume, of *p*H 2.0 and containing 100 ppm CrO_3, were titrated with the ferrous sulfate solutions. The variation in the cell voltage with the volume of added ferrous sulfate is shown in Fig. 3. Since the equivalence points of the two curves are above 500 mv, ferrous sulfate solutions within the range of concentration mentioned may be used for reduction.

The effect of temperature is shown by the data in Table IV. The equivalence points are recorded for

TABLE II. EFFECT OF INITIAL *p*H OF THE WASTE ON CELL READING AT EQUIVALENCE POINT IN TITRATION OF CHROMIC ACID WASTE

Waste Sample: 200 ml 100-ppm CrO_3 solution
Titrant: 3 per cent $FeSO_4$ $7H_2O$ solution of *p*H 2.0
Room Temperature

Chromic Acid Initial *p*H	Ferrous Sulfate Added ml/100 ppm CrO_3	Cell Reading at Equivalence Point* mv
1.4	5.25	603
1.7	5.10	557
2.0	5.25	525
2.5†	5.30	506
3.0‡		
5.0‡		
Weighted Average	5.23	

*By method of second derivatives.
†Precipitate forms which tends to foul the electrodes.
‡No end point possible, acidity being insufficient for complete reduction and satisfactory electrode performance.

TABLE III. EFFECT OF INITIAL *p*H OF THE WASTE ON CELL READING AT EQUIVALENCE POINT IN TITRATION OF SODIUM CHROMATE WASTE

Waste Sample: 200 ml 383-ppm K_2CrO_4 solution (equivalent to 200 ppm CrO_3)
Titrant: 3 per cent $FeSO_4$ $7H_2O$ solution of *p*H 2.0
Room Temperature

Sodium Chromate Initial *p*H	Ferrous Sulfate Addition ml/100 ppm CrO_3 equivalent	Cell Reading at Equivalence Point* mv
2.0	5.20	508
2.5†	2.50	514
	5.43	168

*By method of second derivative.
†The appearance of two equivalence points seems to be associated with the formation of a precipitate during titration, i. e., too high *p*H. At the end of titration the clear solution was free from Cr^{+6}.

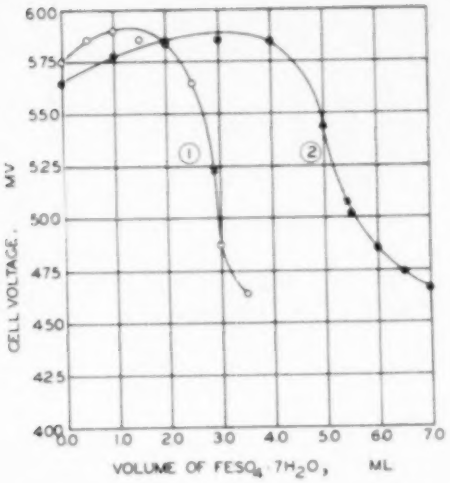


Fig. 3. Variation of cell voltage on room-temperature titration of 200-ml samples of a pH-2.0 acid waste containing 100 ppm CrO_3, with two concentrations of ferrous sulfate solution of pH 2.0. (1) 6 per cent $FeSO_4 \cdot 7H_2O$ solution, end pH 2.08; (2) 3 per cent $FeSO_4 \cdot 7H_2O$ solution, end pH 2.16

titrations of 200-ml samples of a *p*H-1.8 solution containing 100 ppm CrO_3 at two temperatures, with a 3.0 per cent $FeSO_4 \cdot 7H_2O$ solution acidified to a *p*H of 2.0. The cell readings at the equivalence point at 69 and 86° F are 526 and 537 mv respectively. Therefore, temperature variations within this range will not affect the performance of the cell for control of the reduction of hexavalent chromium as long as a setting of 490–500 mv is used on the control chart.

The Control Units

An installation of a unit for continuous control of the reduction of hexavalent to trivalent chromium in plant waste is illustrated in B of Fig. 4. The calomel-platinum electrode assembly (9) measures the oxidation potential of the chromic acid waste continuously fed to the cell through the insulated inlet and outlet lines 10 and 11. This potential is amplified through the voltage amplifier (12) and continuously recorded in mv on chart (13) of a potentiometer recorder. The latter also controls the compressed-air-activated device (14) that operates the proportioning valve (15) which feeds the ferrous sulfate solution from the storage tank (16) into the flowing plant waste.

A similar unit, (A) in Fig. 4, is used to adjust continuously the *p*H of the waste prior to reduction and should be installed on the upstream side of the chromic acid reduction unit. It should be at a sufficient distance to insure adequate mixing of the added acid. The *p*H unit differs from the reduction unit only in that a calomel-glass electrode system (1) is used to control the *p*H of the waste and the proportioning of the sulfuric acid being added.

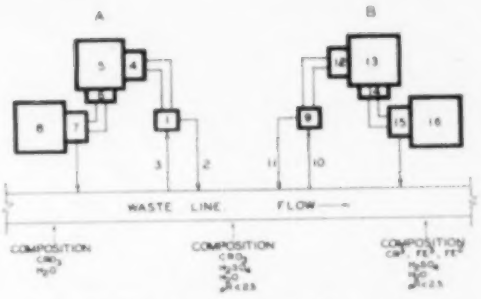


Fig. 4. Schematic arrangement of a typical control installation. (A) pH-control unit, (B) CrO_3 reduction-control unit. (1) Calomel-glass electrode cell; (2) (3), (10) (11) insulated inlet and outlet pipe lines to cell; (4), (12) cell voltage amplifier; (5) pH-potentiometer recorder and controller; (6) compressed-air actuating device for sulfuric acid-proportioning feed valve; (7) sulfuric acid-proportioning valve; (8) sulfuric acid storage and feed tank; (9) Calomel-platinum electrode cell; (13) CrO_3-reduction potentiometer recorder and controller; (14) compressed-air actuating device for operating ferrous sulfate-solution-proportioning valve; (15) ferrous sulfate-solution-proportioning valve; (16) ferrous sulfate-solution make-up, storage and feed tank

TABLE IV. EFFECT OF TITRATION TEMPERATURE ON CELL READING AT EQUIVALENCE POINT IN TITRATION OF CHROMIC ACID WASTE

Waste Sample: 200 ml 100-ppm CrO_3 solution
Titrant: 3 per cent $FeSO_4 \cdot 7H_2O$ solution of *p*H 2

Titration Temperature		Ferrous Sulfate Added ml/100 ppm CrO_3	Cell Reading at Equivalence Point* mv
° F	° C		
69	21	5.79	526
86	30	5.80	537

*By method of second derivatives.

The following maintenance and control features should be emphasized:

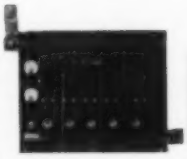
1. In the operation of a continuous waste treatment it is necessary to prevent pollution of streams through a mechanical failure or some unanticipated variation in operating conditions. A dual installation of the units described in Fig. 4 is required to insure positive control of the reduction of hexavalent chromium. These units should be placed several hundred feet apart in the waste discharge line so that sufficient time be allowed for the reaction to be completed following the first unit; the second unit will then serve as an emergency control only.

(Continued on page 1049)

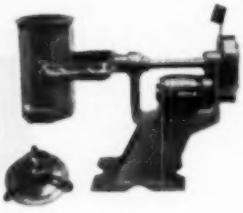
CROWN Equipment

Model 815 Selenium Rectifier

Crown Rheostat with Cut Out Switch



Crown Rheostat



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Crown Tumble Finishing Machines

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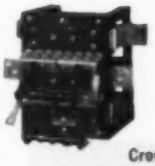
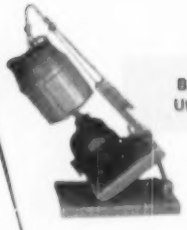


Crown Reversing Switch



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Determination of Impurities in Electroplating Solutions

XIV. TRACES OF CALCIUM IN NICKEL PLATING BATHS

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*AUTHORS

The determination of calcium by means of colorimetric methods has been reported in the literature by many investigators. The materials analyzed and the factors involved in these investigations indicated that a colorimetric method could be made applicable to the determination of calcium in nickel plating baths, even in the presence of appreciable quantities of aluminum, cadmium, copper, chromic oxide, iron, lead, manganese, silicon and zinc.

The method most generally used seemed to be that in which a known amount of standard potassium permanganate solution is reduced by oxalic acid, obtained from precipitated calcium oxalate, and the residual potassium permanganate is measured colorimetrically[2]. However, other methods have been proposed. Calcium has been precipitated as the phosphate and the phosphorus in the precipitate determined colorimetrically by the molybdenum-blue reaction[3,4,5,6,7]. Ferric iron, however, interferes and must be reduced to the divalent state. Calcium can also be determined by precipitating it as the oxalate, converting to oxalic acid, and measuring indirectly the extent of its reduction of a standard amount of ceric sulfate. This is done by treating the excess ceric sulfate with potassium iodide and measuring colorimetrically the yellow color of the liberated iodine[8]. Other methods include precipitation of calcium as the periodomate, solution of the precipitate, and development of a red color by treatment with bromine and sodium hydroxide[9]; precipitation of calcium as the 8-hydroxyquinolate and determination of the hydroxyquinoline in the precipitate with Folins reagent[10]; and precipitation of calcium as the alizarinate followed by colorimetric determination of alizarin in the precipitate[11]. Calcium may also be determined nephelometrically by converting it to a slightly soluble soap such as calcium oleate or calcium stearate[6,7,12].

The most generally applicable method for the isolation of calcium seems to be its precipitation as oxalate. However, the presence of magnesium in considerable amounts requires special precautions during the precipitation[6,8,11,13]. The use of the mercury cathode for the separation of heavy metals from aluminum, calcium, and similar metals has also been widely practiced[8,14,15]. Difficulty is experienced, however, in attempting to separate the electrolyte without re-solution of the amalgamated materials. The separation, furthermore, requires considerable time.

Other methods for the separation of calcium from specific ions have been developed. The separation of calcium from lead by the use of carbon dioxide and pyridine has been reported[12]. The complexing of iron with thioglycolic acid has been shown to be an effective method for separating calcium from iron, and also from nickel, chromium, and zinc[16]. At a *p*H of 5.4 and by the use of hexamethy-

lene tetramine, iron and aluminum have been separated from calcium[8].

In order to precipitate calcium oxalate quantitatively, one must give careful consideration to the *p*H and to the other ions present in the solution to be analyzed. For an excellent review of these factors, the work by Sendroy[11] may be consulted. Additional information, on the use of the filter stick instead of the centrifuge in the separation of the precipitate, is given in a report by Holt and Callow[3].

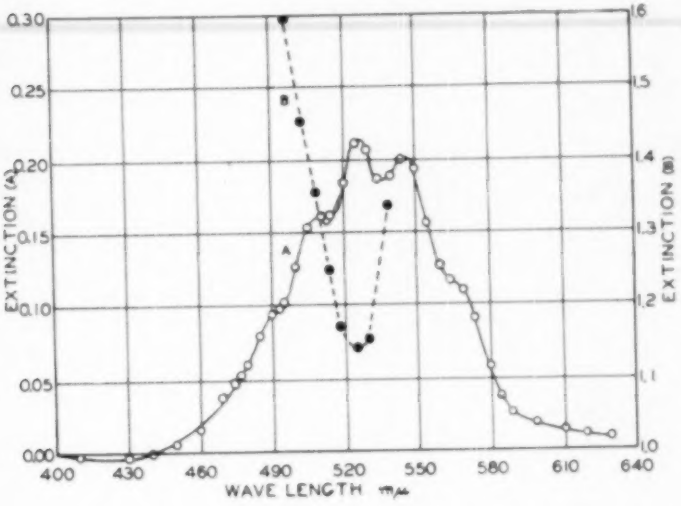

Fig. 1. Calibration curve for determination of calcium by oxalate-permanganate method

TABLE I. CALIBRATION CURVE DATA

Calcium micrograms	Colorimeter Reading	Blank Reading	Corrected Colorimeter Reading	Arithmetic Mean	Base (427) — Arithmetic Mean
0	430	0	430		
0	425	0	425	427	0
0	427	0	427		
100	400	0	400		
100	404	0	404	400	27
100	395	0	395		
200	385	0	385		
200	382	0	382	381	46
200	375	0	375		
400	348	0	348		
400	352	0	352	349	78
400	346	0	346		
600	313	0	313		
600	316	0	316	316	111
600	319	0	319		
800	292	0	292		
800	296	0	296	293	134
800	290	0	290		
1000	257	0	257		
1000	257	0	257	255	172
1000	250	0	250		

a. e. s. research

Developmental Work

After a study of the various method for isolating and determining calcium, it seemed that the method described by Scott[10] for separating small amounts of calcium from very large quantities of magnesium might be adapted to the separation of calcium from a nickel plating bath containing appreciable amounts of the impurities cited above. It was thought that the precipitation of the nickel by sodium hydroxide at the proper *p*H would also remove the heavy metal impurities and minimize any coprecipitation of calcium. If so, the calcium could be precipitated as the oxalate, redissolved in dilute sulfuric acid, and added to a standard solution of potassium permanganate, and the increase in the transmittancy of the solution could then be measured.

In the adoption of this procedure to the determination of calcium in nickel plating baths, two main points had to be considered. The first was that of determining the effect of the nickel and the impurities on the completeness of separation of the calcium ions. In checking this point, it was found that despite the quite voluminous and gelatinous nickel hydroxide precipitate there was no apparent loss of calcium in this step. The only interfering ion was found to be iron, when present in a highly dispersed degree as $Fe_2O_3 xH_2O$. This difficulty was easily eliminated by making the solution definitely acid—about 0.1 *N*—before the precipitation and by adding the sodium hydroxide rapidly. The second point to be considered was that of increasing the sensitivity to the desired degree. Since fifty micrograms of calcium was the smallest amount of calcium which could be determined accurately, Scott's procedure would require too large a sample in order that the desired sensitivity (around 10 ppm) be obtained. It was found possible to increase the sensitivity by precipitating the heavy metals in more concentrated solution than that employed by Scott and by using the entire filtrate rather than an aliquot portion.

Preparation of Calibration Curve

In the preparation of a calibration curve for calcium 1-, 2-, 4-, 6-, 8- and 10-ml portions of a standard solution of calcium nitrate containing 100 micrograms of calcium per milliliter were pipetted into each of six 250-ml beakers containing 5 ml of a synthetic all-chloride nickel plating bath. A seventh beaker containing 5 ml of the bath only served

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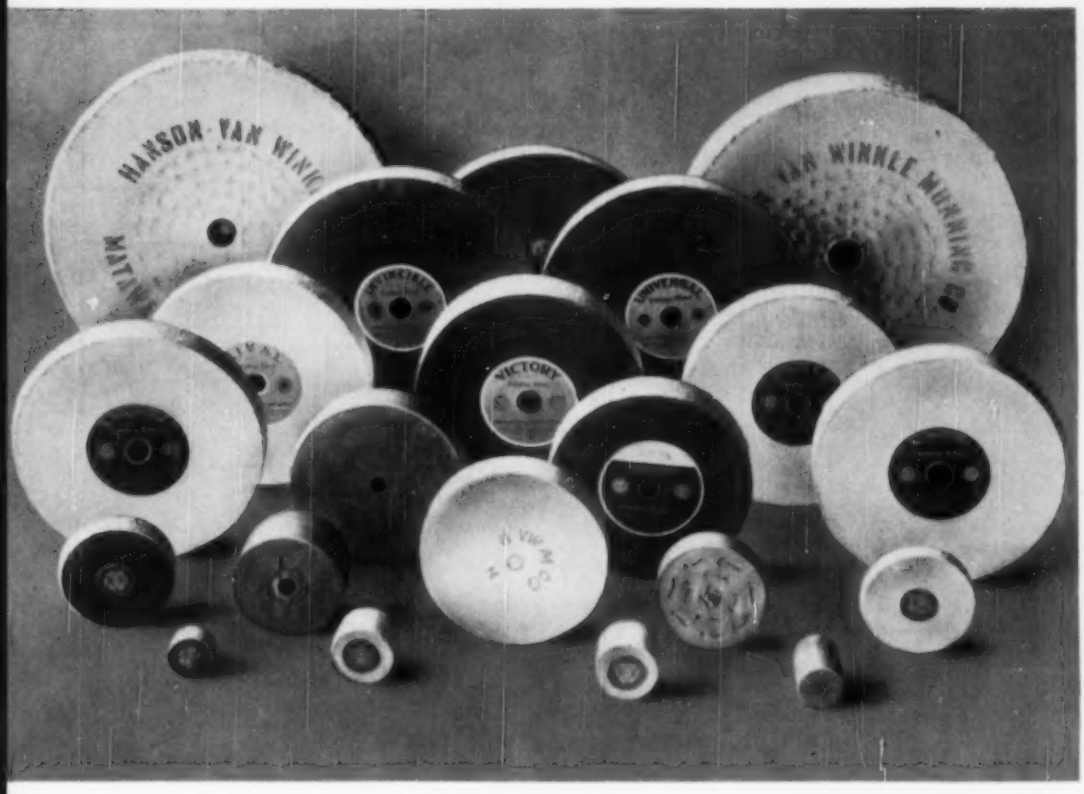

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as a blank. These solutions were treated according to the "Recommended Routine Procedure" described in detail later in this paper, and the results obtained are shown in Table I.

The calibration curve, which is obtained by plotting the base reading (427) minus the arithmetic-mean reading against the corresponding micrograms of calcium, is shown in Fig. 1. It shows that Bouguer-Beer's Law is not obeyed over the concentration range tested, but that above 200 micrograms of calcium it is essentially a straight line.

In order that maximum sensitivity be obtained, the wave length of the incident light should coincide as nearly as possible with the wave length at which potassium permanganate solutions exhibit maximum absorption. This is around 525 millimicrons as shown by the transmittancy curve for potassium permanganate, curve (A) in Fig. 2. To obtain light of a wave length around 525 millimicrons, the green filter No. 54 supplied with the Klett-Sommerson colorimeter may be used. The transmittancy curve of this filter, shown in curve (B) Fig. 2, exhibits maximum transmission between 525 and 540 millimicrons, which makes it a good filter to use in this determination.

Accuracy and Precision of Method

The accuracy and precision of the method were tested by preparing 100 ml of a synthetic all-chloride nickel plating bath containing suitable amounts of the aforementioned metal ions in order to approximate more closely actual operating conditions than does the pure nickel plating bath.

The metal ions and the amounts added are shown in Table II. They were added, when possible, either as the solid chlorides or nitrates, and the solution was heated, shaken thoroughly, and then cooled and filtered.

The procedure for checking the accuracy of the method is the same as that for the "Recommended Routine Procedure," except that single runs are made instead of triplicates. This gives one the accuracy that can be expected on single runs. Table III lists the results obtained, which show that the accuracy of the method is fairly good, the relative error for each of the samples being less than 10 per cent.

The precision of the method was checked by taking four samples, each containing 800 micrograms of calcium, and determining the amount of calcium by the above procedure. The data in Table IV show that the method has good precision and that the results are reproducible although usually on the low side.

An additional check on the accuracy and precision of this method was obtained by sending a test solution to several co-operating laboratories. The laboratories which kindly consented to analyze the test sample were Standard Steel Spring Company, Bethlehem Steel Company, The Udylite Corporation and the Houdaille Hershey Corporation. Their results and those obtained by the writers are listed in Table V. They show that the laboratories which have reported checked each other well within 10 per cent, although all were unfamiliar with the procedure.

TABLE II. IONS ADDED TO SYNTHETIC ALL-CHLORIDE NICKEL BATH

Metal Ions	Amount Added mg/100 ml	Concentration g/l
Aluminum	100	1.0
Cadmium	100	1.0
Chromic Oxide	20	0.2
Copper	20	0.2
Iron	100	1.0
Lead	5	0.05
Manganese	500	5.0
Silicon	100	1.0
Zinc	100	1.0

TABLE III. ACCURACY DATA

Calcium Added micrograms	Colorimeter Reading	Blank Reading	Corrected Reading	Base (427)—Corrected Reading	Calcium Found micrograms	Error %
0	427	0	427	0		
200	385	0	385	42	192	4
400	353	0	353	74	376	6
600	330	0	330	97	540	10
800	294	0	294	133	760	5

TABLE IV. PRECISION DATA

Calcium Added micrograms	Average Reading	Blank Reading	Corrected Average Reading	Base Reading	Calcium Found micrograms
800	294	0	294	133	760
800	290	0	290	137	782
800	296	0	296	131	748
800	292	0	292	135	770

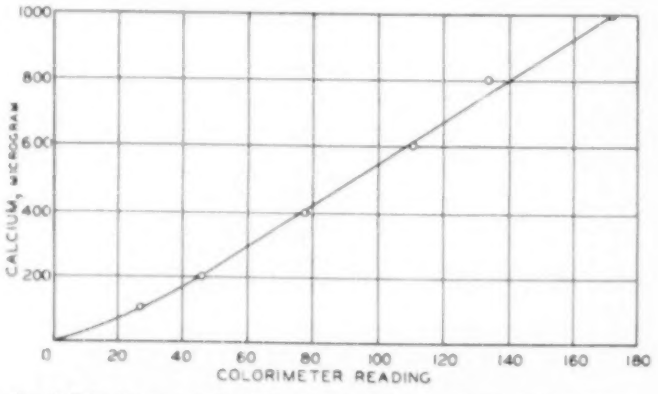

Fig. 2. Extinction vs. wave length for (A) potassium permanganate solution containing 500 micrograms of manganese per 100 ml of solution, (B) Klett-Sommerson green filter No. 54 (extinction units on the right)

Recommended Routine Procedure

The routine procedure finally adopted for the determination of calcium in nickel plating baths is as follows:

Reagents Required

1. **Potassium permanganate solution**—0.0910 *N*
   Dissolve 2.877 g of potassium permanganate in 100 ml distilled water and dilute to one liter. Standardize against sodium oxalate and store in the dark.
2. Ammonium oxalate—saturated solution
   Add ammonium oxalate to about 100 ml of distilled water until no more will dissolve on prolonged mixing, filter the solution to remove the remaining ammonium oxalate.
3. Formate buffer—*p*H 3.7
   Add 3.15 g of ammonium formate and 2 ml of 24–*N* formic acid to enough distilled water to make 100 ml of solution.
4. Hydrochloric acid—6*N*
   Dilute c.p. concentrated hydrochloric acid 1:1 with distilled water.
5. Sulfuric acid—9*N*
   Dilute c.p. concentrated sulfuric acid 1:4 with distilled water.
6. Sodium hydroxide (carbonate-free)—1*N*
   Dissolve 40 g of c.p. sodium hydroxide in 40 ml of distilled water. Allow the sodium carbonate to settle, and siphon off or centrifuge off the carbonate-free sodium hydroxide. Dilute this with distilled water to make a 1–*N* solution. Store in a wax-lined container, which is protected from atmospheric carbon dioxide in the apparatus shown in Fig. 3.
7. Standard calcium nitrate solution—100 micrograms/ml
   Dissolve 0.590 g of calcium nitrate in enough distilled water to make 100 ml of a stock solution containing 1.0 mg calcium per ml. Dilute this 1:10 with distilled water to prepare standard solution containing 0.1 mg Ca/ml.
8. Synthetic nickel plating bath
   Dissolve 347.2 g of c.p. nickel chloride and 30.0 g boric acid in enough distilled water to make a liter of solution.

Apparatus Required

1. Two 50-ml burettes
2. **Pipettes of 1-, 2-, and 5-ml capacity**, accurately calibrated
3. 250-ml beakers
4. Bell jar with top and side tubulations
5. Buchner filter funnel
6. Silax No. 2010 sintered-glass filter
7. *p*H meter
8. 100-ml volumetric flask
9. Klett-Sommerson colorimeter with No. 54 green filter, or any other colorimeter or photometer with a suitable filter to give incident light in the range of 525 millimicrons

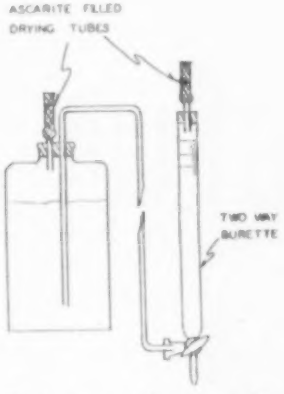

Fig. 3. Apparatus for storing and dispensing the sodium hydroxide solution

Procedure

A. Separation of Calcium

1. Place 5 ml of the nickel plating bath in a 250-ml beaker and dilute to 50–60 ml with distilled water.
2. Adjust the *p*H to 3.0 with 6–*N* hydrochloric acid.
3. Add 0.1 ml more acid and boil to remove carbon dioxide.
4. Titrate the solution rapidly with 1–*N* carbonate-free sodium hydroxide to a *p*H of 10.5, stirring rapidly during precipitation of the nickel. Then add 1 ml of 1–*N* hydrochloric acid (*p*H = 10.0).
5. Filter off the nickel hydroxide in two steps: first through a Buchner funnel to remove the bulk of the precipitate and to facilitate the washing of the precipitate, and then through a Silax No. 2010 filter using suction and wash with four 2-ml portions of distilled water.
6. Treat the filtrate with 1 ml each of the formate buffer and the ammonium oxalate solutions. Digest at 95° C until the volume is reduced to 20–30 ml and then allow the solution to stand at room temperature for 30 minutes.
7. Filter the calcium oxalate through a Silax No. 2010 filter using suction and wash the precipitate with four 1–2 ml portions of distilled water. Remove the filter from its holder and carefully rinse the bottom and the sides of the filter with distilled water.
8. Dissolve the precipitate off the filter with two 10-ml portions of hot 9–*N* sulfuric acid followed by two 5-ml washings with distilled water. Collect the solution plus the washings in a 100-ml volumetric flask.

B. Development and Measurement of Color

9. Add 2 ml of standard potassium permanganate solution and dilute to volume (100 ml) with distilled water. Shake thoroughly to mix well.
10. Using a clean test tube partially filled with distilled water as the reference solution, adjust the colorimeter so that the galvanometer needle is at zero deflection when the scale reading is zero.
11. Pour out the water, rinse the tube several times with the unknown solution, and then partially fill the test tube with the solution. Measure its transmittancy by placing the tube in the colorimeter and rotating the dial until the galvanometer is again at zero deflection, and record the reading on the scale attached to the dial.
12. Record the reading of a blank which had been run in the same manner as the unknown except that no nickel bath sample was taken.
13. Record the reading of a solution containing 2 ml of a standard potassium permanganate solution plus 20 ml of 9–*N* sulfuric acid diluted to 100 ml. This reading is the "base" reading. If this base reading on the colorimeter is above 500, 1 ml of the standard $KMnO_4$ solution should be used instead of the 2-ml portion.
14. From the "base" reading subtract the corrected reading of the unknown. Reference to the calibration curve will then indicate the quantity of calcium equivalent to this base reading minus the corrected scale reading.

TABLE V. RESULTS OBTAINED BY COOPERATING LABORATORIES

Laboratory	micrograms Ca in 5-ml Sample	Calcium ppm
A	775	155
B	741	148
C	790	158

a. c. s. research

Calculations

For a sample calculation, suppose we have an unknown sample reading of 316, a blank reading of 427, and a "base" reading of 427. We subtract the corrected unknown reading from the base reading (427 − 316 = 111) to obtain the scale reading related to the quantity of calcium present. In the calibration curve a reading of 111 corresponds to 0.615 milligrams of calcium in 5 ml of bath. Therefore, 0.615 x 200 = 123.0 mg/l or 123 ppm is the concentration of calcium in the nickel plating bath.

"Stop and Go" Method

In the development of a "stop and go" method, the same procedure is followed as that described in the "Recommended Routine Procedure". After the color has been developed, the solution is transferred to a Nessler tube and the unknown compared to a series of standards.

To prepare this series of standards, pipette 2-, 4-, 6-, 8-, and 10-ml portions of the standard calcium solution used in preparing the calibration curve into Nessler tubes, add 20 ml of 9-*N* sulfuric acid, 2 ml of the standard potassium permanganate solution, and dilute to the mark. Shake well to mix, and then compare the color of the unknown solution to these standards.

The detailed procedure is as follows:

1. Pipette 5 ml of the nickel plating bath into a 250-ml beaker.
2. Starting with step (2) of the "Recommended Routine Procedure", proceed in the same manner up to but excluding step (8).
3. Dissolve the precipitate with two 10-ml portions of hot 9-*N* sulfuric acid followed by two 5-ml washings with distilled water. Collect the solution and the washings in a clean Nessler tube. Dilute to 100 ml with distilled water.
4. Compare the unknown with the series of standard solutions against a white background.
5. The concentration of calcium in the unknown is equal to the amount of calcium in the standard solution the color of which matches that of the unknown the closest. It is possible to detect differences of about 100 micrograms of calcium by this method.

Summary

Calcium is determined in a nickel plating bath by first precipitating the heavy metals as hydroxides, and then separating the calcium from the filtrate by precipitating it as the oxalate at a controlled *p*H. The calcium oxalate is converted to oxalic acid, and the acid is allowed to reduce a known amount of potassium permanganate. The transmittancy of the residual potassium permanganate solution is then measured using a Klett-Summerson colorimeter with a No. 54 green filter.

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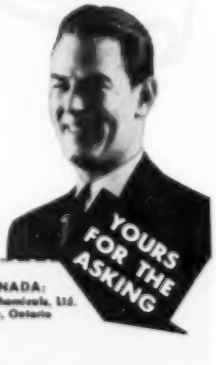

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Book Review

— DR. HAROLD J. READ, *Associate Professor of Metallurgy, The Pennsylvania State College*

SURFACE ACTIVE AGENTS, Their Chemistry and Technology, by Anthony M. Schwartz and James W. Perry, 1949, xi + 579 pages. Interscience Publishers, Inc., 215 Fourth Avenue, New York 3, N. Y. Price, $10.00.

The reading of this book has been the source of much pleasure and technical profit to the reviewer, and he believes that it will be found useful as well as enjoyable by those scientific workers who are at all interested in surface phenomena. The authors have succeeded admirably in their aim of producing a text which would give the reader a well organized review of all aspects of developments in surface-active agents.

Some time ago there was reviewed here a book by J. J. Bikerman entitled *Surface Chemistry* (PLATING, August, 1948). Although splendidly written, it was limited for the most part to rather abstract and theoretical topics and dealt only sketchily with the nature and use of those materials which may be employed to modify the surface properties of solutions, namely, surface-active agents. The present book by Schwartz and Perry will serve as a valuable adjunct to Bikerman's text by supplying such information. There is, to be sure, some duplication, but not enough to deny one a place in a technical library because of prior possession of the other. Even in passages where similar matters are discussed, the approach and treatment of the material is sufficiently different so that much may be gleaned from each. The two together form an excellent nucleus for a collection of books in the subject field, and might well suffice for those who wish to have available the most information in the fewest books.

Aside from the introduction, the volume consists of three parts which deal successively with processes for synthesizing and manufacturing surface-active agents, the physical chemistry of these materials in theory and practice, and practical applications of surface-active agents.

The complicated task of describing in a reasonable space the manifold processes for synthesizing and manufacturing the exceedingly numerous and structurally diverse compounds has been neatly handled by classifying the compounds primarily on the basis of the nature of the hydrophilic group and secondarily according to the manner in which the hydrophilic groups and the hydrophobic groups are joined. A further basis for classification is found in the nature of the hydrophobic group. Those materials used mainly in nonaqueous systems are classed separately, and it is emphasized that no attempt has been made to review completely this rather new and very broad field. Finally, a separate class has been provided for the water-insoluble compounds which find use as emulsifying agents. The system of classification is thoroughly and clearly discussed in the introduction, and it is well adhered to in the subsequent detailed presentation of factual material on the structure and preparation of the many surface active agents which have been developed both in this country and abroad.

It would be obviously impossible for the authors to deal in minute detail with all of the compounds used (or suggested) as surface-active agents. They have, therefore, provided numerous references to the journal and patent literature, particularly the latter. The patent citations are not intended to be completely exhaustive, and are not concerned with the legal or historical aspects of the subject matter. They do, however, touch upon all of the important technical developments. An idea of the extent of the literature references may be obtained by noting that there are approximately 1600 footnotes many of which contain several citations.

The compounds are referred to as a rule by their structural names. Trade names are used only to a limited extent. This is as it should be since several trade names may be used for the same compound and, even worse, a given trade name may at one time or another refer to two or more different compounds.

Part II, which deals with the physical chemistry of surface-active agents, is the section of the book which most nearly overlaps Bikerman's text. The authors' treatment is considerably more terse than Bikerman's, but is none the less intelligible. They have chosen to subdivide their discussion into sections on the surface and interfacial relationships of pure liquids, the surface properties of solutions, the bulk properties of surface-active solutions, the gross effects and technical evaluation of surface-active agents (a particularly engrossing section), and the relationship of surface activity to chemical constitution.

The third part of the book, which is devoted to practical applications, may be of minor interest to those who are interested only in those applications related directly to metal finishing. Only about eight pages deal directly with such uses. It must be remembered, however, that the journal and patent literature is still exceedingly meager when it comes to *significant* papers and patents relating to the use of surface-active agents in metal technology. This is a field where there is great opportunity for development rather than the use of principles and products whose applications have already been worked out.

Where necessary, excellent illustrations in the form line drawings have been provided. The author and subject indexes are remarkably complete, apparently without error or omission.

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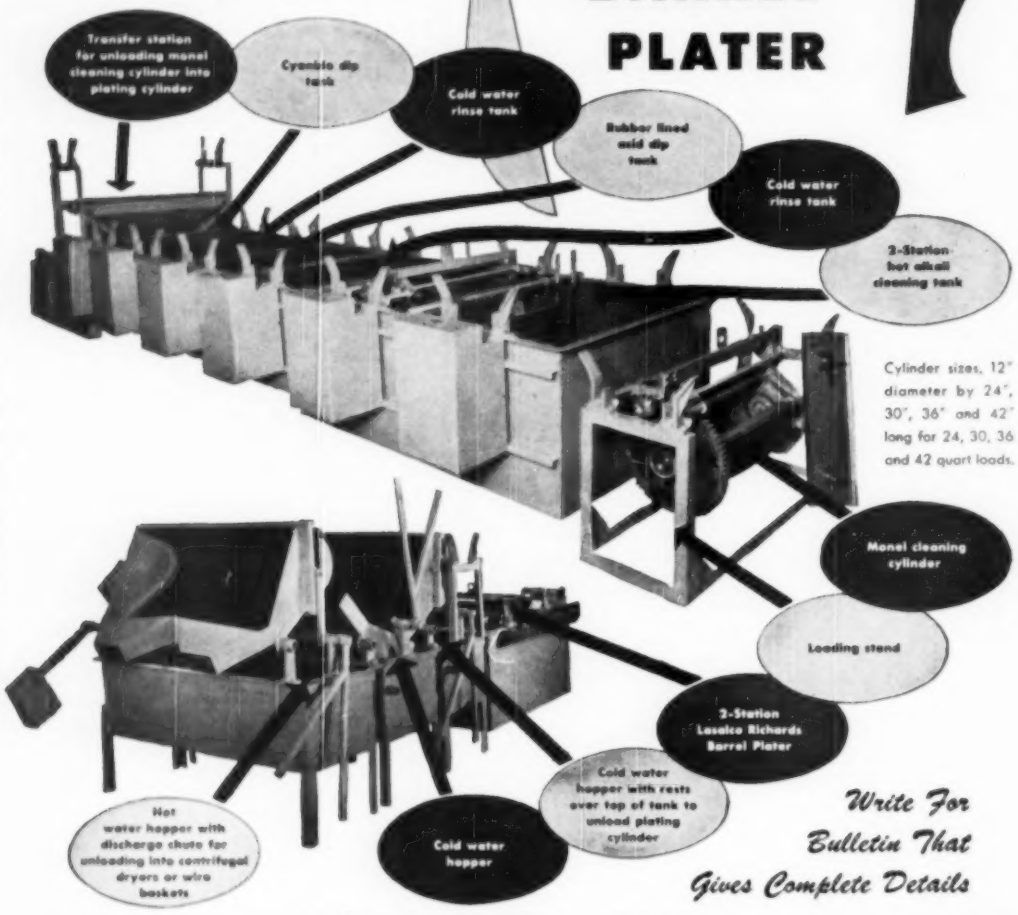
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——readers' questions of general interest——

Q. 58. How can I plate German-silver hollow-ware without peeling. I do all right on white metal, copper, and yellow brass. My procedure is cathodic electrocleaning, rinsing, hand scrubbing to remove tripoli residues, scratch brushing with FFF pumice, dipping in 10 per cent sulfuric acid, silver striking, and silver plating. The deposit seems soft.

A. It is very probable that the surface of the nickel silver has become passive in the buffing operations. Cleaning will not activate the nickel silver.

The surface can be activated by one of the following methods: (1) Strike for 10–15 seconds in Wood's nickel chloride solution, *or* (2) make the work cathode for 10–20 seconds in a 32° Baume sulfuric acid at room temperature and 6 volts pressure. This will not destroy the lustre, *or* (3) After cleaning use a 50 per cent hydrochloric acid dip, nickel plate in the standard solution, rinse in water, then in a weak cyanide solution. Follow this with a silver strike and plate, *or* (4) On old work from which the "old" plate may not have been entirely removed, a copper cyanide plate can be used. Plate for ½–5 minutes and see to it that the article be well covered with a clear copper coating. A standard copper cyanide solution at 140° F and a pressure of 2.5–4 volts is suitable. Keep the free cyanide content at standard because high free cyanide may cause blistering.—G. B. Kogan.oom.

Q. 59. What can we do to prevent hydrogen embrittlement in chromium plating?

A. It is well known that high-carbon steels or carburized steels become hydrogen embrittled when chromium plated. If such embrittlement goes far enough, cracks may begin to develop in the surface of the basis metal during the plating operation before the hydrogen can be driven out by means of low temperature heat treatment, at 500° F or less. Sometimes the difficulty can be eliminated by the use of mechanical methods for preparing the surface or strictly anodic treatments. When this is not sufficient, it is common practice to reduce the hardness of the basis metal surface.

The specific subject is being treated in a Tecommended Practice for Chromium Plating on Steel for Engineering use, A. S. T. M. Designation B177–45, available from this office. The general subject of embrittlement is discovered in a Tentative Recommended Practice for Preparation of High-Carbon Steel for Electroplating which has recently been prepared by Committee B-8 of the American Society for Testing Materials and which we expect to publish in the pages of PLATING.—K. G. SODERBERG.

Q. 60. Please advise us in the matter of the maximum time element allowable between zinc plating thin spring steel and the heat treatment necessary to remove hydrogen embrittlement. The plate thickness is 0.0002 inch. Our customer feels that heat treatment must be done immediately to eliminate any possible damage due to the hydrogen pressure in both the plate and the steel. We are heat treating at present anywhere from one to three days after plating and find that the embrittlement is entirely gone.

A. In our studies of hydrogen introduced into steel during plating, there is no evidence that heat treatment immediately after plating provides any advantage over heat treatment several days later. Hydrogen has accomplished whatever damage it might cause (cracking of the steel) by the time plating has been completed, so that no further damage can be expected after removal of the parts from the tank. There will be some tendency for slow release of hydrogen during standing at room temperature, but a heat treatment is necessary to effect full recovery.—CHARLES L. FAUST.

Q. 61. In replating very old holloware I encounter a hard, brittle black scale which often does not loosen on soaking in cyanide solution. Alternate copper plating and scratch brushing with pumice repeated as much as 4–5 times works, but is very time consuming. A polishing wheel just slips over the scale, damaging clean areas. Can you suggest a better method?—Also, is sandblasting used to finish the inside of holloware?

A. Old silvered holloware was made of pewter, Britannia metal or other alloys of lead, tin, antimony and other metals. The age scale is very thick at times and much harder than the basis metals. It may be removed as follows: (1) soak and electric clean in a mild brass cleaner, (2) rinse thoroughly, (3) strip any remaining silver with reverse current in a cyanide solution (this also tends to loosen the scale) and rerinse thoroughly, (4) soak in a 25 per cent by volume muriatic acid solution for 5–30 minutes and rinse, (5) use a medium stiff scratch brush which usually removes the scale quite easily—use pumice during brushing if the scale is stubborn.

The inside of holloware is usually scratch brushed; no case of sand blasting is known except to produce a satin finish on the outside. After plating, scratch brushing is used to produce lustre.—F. K. SAVAGE.

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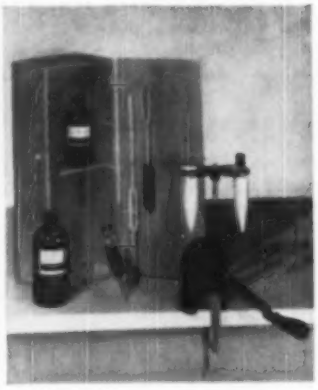

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Article Abstracts

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Testing the Wear Resistance of Hard Chromium Deposits. Hans Wahl and Karl Gebauer. Metalloberflache **2**, 25-37 (February, 1948).

An illustrated study of different types of wear under various conditions, including the effect of both temperature, current density, and nature of the electrolyte on the hardness and wear resistance of chromium plating. Test data are tabulated and graphed, and the method of testing is fully described.

The Welding, Brazing, and Soldering of Coated Metals. E. V. Beatson. J. Electrodepositors' Tech. Soc. **24**, 41-56 (1949).

The first part of this paper is a descriptive review of joining processes. The second part considers the applicability of these processes to various coated metals. Such variables as the length of time the coated metal stands before joining, the effect of various types of flux, the thickness of the coating, types of solder or welding rod, are discussed. Some of the conclusions drawn are: It is preferable to plate after brazing; whatever the process, it is essential that the plating be of the highest quality and of consistent, specified thickness; when soldering, too thin a plate is often troublesome; when welding, better results are obtained with thinner plate. Many sketches and photographs are presented.—LYMAN B. SPERRY.

Practical Aspects of Plating in the Spoon and Fork Trade. F. B. Hill. J. Electrodepositors' Tech. Soc. **24**, 57-78 (1949).

A very comprehensive description of the production methods used by one firm in the manufacture of spoons and forks, starting with the melting of nickel, copper, and zinc to cast ingots of the base-metal alloy. Rolling, stamping, pressing, polishing, plating of silver

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or speculum, buffing, and electropolishing follow. Essentials and advisable precautions in the various steps are pointed out. Some photographs are included. Considerable discussion follows the paper.—LYMAN B. SPERRY.

Recent Developments in Low-Tension Power Supply. D. Ashby. J. Electrodepositors' Tech. Soc. **44**, 79–90 (1949).
The development of the rectifier is reviewed, from the copper-oxide type developed in 1925 to the present. The original type is rated as better than a motor-generator set (English). The ultimate in rectifiers is claimed to be an oil-cooled, "double-voltage" type developed in 1945. A curve is shown for this type, with watt efficiency plotted against percentage of full load current; the efficiency is 89–91 per cent at 18–100 per cent of full-load current. Automatic control of voltage, current, or current density is described, and also an automatic control device for the chromic acid anodizing process. It would seem to this abstractor that the automatic control of current density would not work in plating baths in which any significant polarization occurs.—LYMAN B. SPERRY.

Electrodeposition in the Printing Industry—P. B. Upton. J. Electrodepositors' Tech. Soc. **24**, 95–110 (1949).
A rather thorough description of printing processes and how electrodeposition is used in each. Limitations and advantages are pointed out. The properties of different electrodeposited metals and their internal stress are considered at length. Special preparation of surfaces for plating is very important, and is well described. General practice in the plating of copper, nickel, and iron is presented and formulae given. Considerable discussion follows the paper.—LYMAN B. SPERRY.

Tank Linings and Insulating Materials. V. Evans. J. Electrodepositors' Tech. Soc. **24**, 129–143 (1949).
A review of tank lining and rack coating materials, many of which would be considered obsolete in the United States.—LYMAN B. SPERRY.

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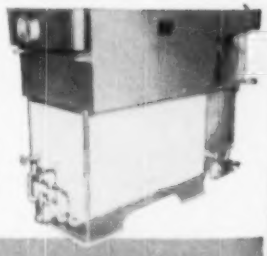

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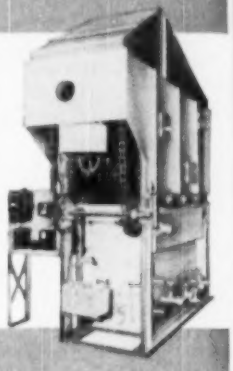

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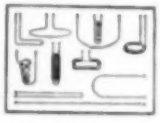

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Cadmium Recovery Practice in Lead Smelting. P. C. Feddersen and Harold E. Lee. J. Metals 1, sec. 3, 110–117 (February, 1949).

Outlines the various procedures, including a description of equipment. Gives specific information concerning practice at major lead smelters throughout the world. More extensive information is given concerning cadmium recovery at the mill of Bunker Hill and Sullivan Mining and Concentrating Company, Kellogg, Idaho. Includes market specifications for cadmium.

The Effect of Hardness on the Structural Changes of Crystal Surfaces Caused by Working. K. H. Leise. Z. Physik 124, 258–263 (February 24, 1948).

Disproves Beilby's theory of a liquid-like surface film caused by mechanical working (such as polishing). Data are graphed.

Galvanic Action Between Lead, Worthite and Other Acid-Resistant Alloys in Sulfuric Acid. W. E. Pratt and E. T. Collingsworth, Jr. Corrosion 5, 39–44 (February, 1949).

Reports results of some preliminary investigations to determine the exact mechanism involved in the changes of the relative potentials of lead and some stainless steels, notably Worthite, in sulfuric acid. The work was done in order to shed light on corrosion of chemical pumps in which Worthite is anodic to large areas of lead. The trouble can be avoided by use of an oxidizing agent such as sodium chromate, ferric sulfate, or copper sulfate; by reaeration; or by insulation to prevent contact of the two metals.

Chromizing at 1700° to 1890° F. Iron Age 163, 65 (January 27, 1949).

Describes chromizing process introduced in this country by Diffusion Alloys Corporation, New York. The parts to be treated are packed in conventional pack-carburizing containers containing a ferro-chromium base material and a suitable catalytic agent, and heated to 1700–1850° F, depending upon carbon content. Preliminary tests indicate promising corrosion

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The Present Position Regarding Chemical Pretreatments for Magnesium Alloys. S. E. Mayer. Magnesium Review and Abstracts **8**, 29–45 (January, 1948).
Reviews treatments and classifies them according to the chemistry of the film formed. Discusses the principal types, giving bath compositions. Considers possibilities of future developments. Tabulates the various proprietary methods in seven groups with information on inventor, alternative designation, literature or patent reference, bath compositions, method of application, alloys for which suitable, purpose of treatment, general description, pretreatment necessary, and special comments.

Barrel Tumbling of Aluminum-Alloy Pieces. Charles Etienne. Rev. l'aluminium **25**, 377–382 (December, 1948).
Describes French practice. Structural changes in the surface layer are shown. Optimum conditions, including preparation for processing, time of tumbling, size of tumbling balls, their amount, etc., are indicated. (To be continued.)

Chemical Brightening of Aluminum and Its Alloys; A Description of a New Process. V. F. Henley. Sheet Metal Industries **26**, 382–384 (February, 1949).
Describes "Alpol" bright-dipping process developed in Britain and its applications. Illustrated.

Decorative Electroplating on Aluminum. Glenwood J. Beckwith. Metal Finishing **47**, 48–54 (February, 1949).
Deals with relationship of foundry practice and successful plating of die, permanent-mold, and sand castings; with polishing and buffing of castings, extrusions, and stampings; with ball burnishing; with various cleaning procedures; with chemical zinc coating; with copper, nickel and chromium plating, and electropol-

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ishing of copper plate; with removal of aluminum from nickel baths; with use of aluminum plating racks; and with salvaging of plated aluminum items.

Preliminary Investigations on Plating with Titanium and Titanium Alloys. N. N. Gratsianskii and A. P. Vovkogon. Zapiski Instituty Khimii Akademii SSSR 7, No. 2, 173–176 (1940); Henry Brutcher, Altadena, Calif., Translation No. 2183.
Presents a literature review of earlier work on isolation of metallic titanium by three groups of processes including electrodeposition. Describes studies of electrodeposition of straight titanium deposits and of deposits made up of titanium-zinc and titanium aluminum alloys, from aqueous solutions and from fused-salt mixtures.

Method for Rapid Determination of Sulfuric Acid in a Chromium Electrolyte. V. A. Il'in. Zavodskaya Laboratoriya **14**, 1389–1390 (November, 1948).
Proposes a rapid method (10–15 min.) based on the electrochemical processes taking place during electrolysis. Method and apparatus are described.

Determination of Thickness of Thin Films Deposited on Crystalline Surfaces. Charles Legrand. Comp. rend. **227**, 831–833 (October 27, 1948).
Proposes an X-ray diffraction method for coated metal surfaces. Theoretical bases are reviewed and area of application of the method is indicated.

Vitreous Enamels for Aluminum. (Continued.) P. J. Carlisle, A. J. Deyrup, and A. O. Short. Finish **6**, 33, 34, 44 (February, 1949).
Continues description of production procedures. Includes sections on frequency of testing, free-alkali and chromate determinations on the bath, bath preparation from various chromate sources, chemical requirements, bath corrections, and typical color-coat formulas.

Cleaning Aluminum Sheet Prior to Spot Welding. Part I. Gerard H. Boss. Metal Progress **55**, 499–503 (April, 1949).
All the available information on the problem of surface preparation as it relates to spot welding has been collected and summarized. Most of the investigation was carried on by Wendell F. Hess and associates at Rensselaer Polytechnic Institute. Discussion includes measurement of contact resistance, importance of surface resistance, preweld cleaning and nonproprietary cleaners.

The Surface Treatment of Aluminum and Its Alloys by Anodic Oxidation. S. T. M. Johnstone. Council of Sci. and Ind. Res., Div. of Aeronautics

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(Australia), Report SM116 (August, 1948) 23 pp.; Al. Labs. Abst. Bull. **20**, 295 (May, 1949).
This is a review of present theory and practice of surface treatment including principles and mechanism of anodic oxidation and various anodic treatment processes. Properties of anodic films, including color, thickness, absorption, hardness, abrasion resistance are given, as well as corrosion resistance and some physical properties. Sealing and dyeing treatments and applications are described.

Electrometric System

(Continued from page 1031)

2. It is desirable to provide a sump in the waste discharge line over which the control unit can be installed. This increases the retention time and permits the use of air for rapid mixing, thereby hastening establishment of equilibrium and improving the performance of the control unit, as well as reducing the consumption of chemicals.

3. Stray currents must be eliminated from the chromic acid reduction assembly. This can best be done by using insulated sections in the waste lines to and from the cells and by other obvious steps.

4. Fouling of the electrodes can be minimized by maintaining the waste at a *p*H below 2.5. Periodic flushing of the electrodes with concentrated hydrochloric acid is necessary and effective. If hard-water chemicals are causing fouling, a water softener of the phosphate type continuously fed to the cell is claimed to be effective. The authors have not experienced difficulty from this source.

5. The proper mv setting for the control point on the chart of the chromic acid reduction unit depends upon the chromic acid concentration in the waste. It must be a potential low enough to insure a small excess of ferrous sulfate in the waste at all times. For chromic acid concentrations up to 200 ppm, a setting of 490 to 500 mv is satisfactory.

6. For satisfactory control, the *p*H of a waste containing chromic acid or alkali chromates must be reduced to less than 2.5 prior to reduction, and the final *p*H after reduction must not be more than 2.5.

7. Large concentrations of chromic acid must not be discharged suddenly into the waste, since the *p*H of the waste may then be below 2.5 due to chromic acid alone. Under these conditions there may be insufficient mineral acid available to complete the reaction between the chromic acid and the ferrous sulfate. This means that the *p*H will rise rapidly during reduction and the system will fail to function properly. The use of a dual installation will greatly facilitate handling of such a situation, but will not guarantee complete reduction of hexavalent chromium under extreme conditions.

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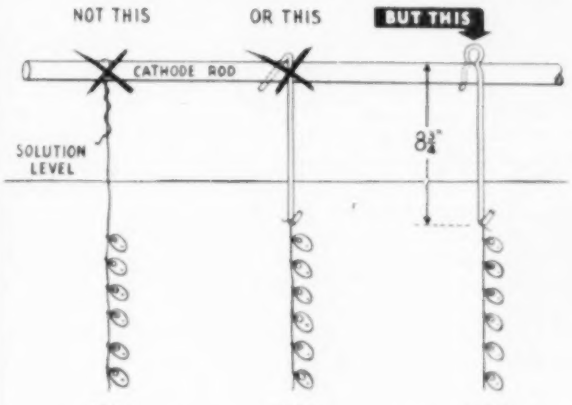

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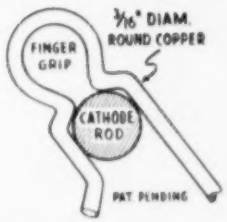

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Patent Abstracts

By GEORGE B. HOGABOOM

Consultant, New Britain, Conn.

Copies of patents may be obtained by writing to Commissioner of Patents, Washington 25, D.C. Price 25 cents each.

No. 2,467,852, April 19, 1949—Electrolytic Sheet Metal Anode—W. L. Pinner, assignor to Houdaille-Hershey Corporation.

I have now found that either a mechanically formed joint (of sheet electrolytic nickel) or a welded joint may be shielded against preferential electrolytic attack in any of several ways. The joint may, for instance, be temporarily protected by providing a relatively nonporous and nonconductive layer or coating over the joint, such, for instance, as an elastic rubber band. After the anode has been in use for some time, corrosion will have progressed sufficiently far to permit the removal of the rubber band or other shielding means without bringing about any excessive subsequent attack on the joint.

It is therefore an important object of the present invention to make available electrolytic metal sheets, and particularly electrolytic nickel sheets, in lengths greater than those formerly available on the market, so that the same can be efficiently used in the electrolytic deposition of the metal of which the electrolytic sheets are formed.

CLAIM 3. A nickel anode comprising two superimposed layers of electrolytic nickel sheets, the sheets of each layer being welded together at their top edges, suspending means attached to said welded top edges, and electrolytic nickel anode scrap welded to an exposed face of one of the said layers to overlie the weld and to cover at least part of the width of said weld between the ends of the sheets of said layer.

3 claims, 7 figures.

References cited: U. S. Patents 114,1;745,47991; 882,110; 1,331,571; 2,043,823; 2,324,342. British Patents 6,102; 426,110; 617,451. "Electroplating with Chromium, Copper, and Nickel", by Freeman and Hoppe (1930), p. 128.

No. 2,467,580, April 19, 1949—Electrodeposition of Nickel—Henry Brown, assignor to The Udylite Corporation.

CLAIM 5. A bath for electrodepositing ductile bright nickel plate comprising an aqueous acid nickel solution comprising essentially a material selected from the group consisting of nickel sulfate, nickel chloride, a mixture of nickel sulfate and nickel chloride, a mixture of nickel sulfamate and nickel chloride, and a mixture of nickel chloride, nickel sulfate and nickel sulfamate, and said solution having dissolved therein diphenyl sulfone 3-sulfonic acid, said solution having a *p*H falling within the range from 1.5 to 6.

CLAIM 6. . . . and said solution having dissolved therein diphenyl sulfone 3.3-disulfonic acid . . .

6 claims.

References cited: U. S. Patent 2,313,372. Metal Finishing, August, 1943, p. 431.

No. 2,468,006, April 19, 1946—Electrocleaning of Metal —Hugh G. Webster, assignor to J. H. Shoemaker, Detroit, Mich.

Work pieces, deposited in a perforated metal basket, may be immersed in the bath. An electric current is then applied to that metal basket of such a nature that the work piece, or the basket, forms the cathode, with the bath receptacle or any other element forming the anode. Thereupon the current is reversed . . . Thereafter the current is reversed again (to its original direction) . . . This is the final step in the preparation of the work piece surface for the further processing.

The bath is of a molten salt type and contains a composition comprising a mixture formed by fusing or melting together a predominant or major proportion of a caustic alkali such as sodium hydroxide or potassium hydroxide in the proportion of 75 to 90 per cent and minor proportions of 7 to 13 per cent sodium chloride, sodium fluoride used in proportions 2 to 6 per cent, and sodium aluminate used in proportions of 0.5 to 5 per cent, all proportions by weight.

The preferred bath is a molten salt bath consisting of about 85 per cent of sodium hydroxide, about 10 per cent sodium chloride, about 4 per cent sodium fluoride, and about 1 per cent sodium aluminate, by weight.

The temperature of the bath may be between 600 and 1000° F but the optimum results have been obtained at 850–900° F.

The electrical current is slow alternating or successively reversed direct, of 4 to 6 volts, with a preferred intensity of 50 amperes per square foot.

I have found that five minutes has proven satisfactory when the work piece is an anode and ten to thirty minutes when work piece is a cathode.

CLAIM 6. An electrolytic process for transforming the surface of a ferrous metal work piece completely into a layer of pure ferric comprising immersing the ferrous work piece into a molten salt bath composition consisting essentially in approximate proportions by weight of a major proportion of caustic alkali, a minor proportion of sodium chloride and 0.5 to 5 per cent sodium aluminate, and directing successively reversed direct currents from the work piece through the bath.

References cited: U. S. Patents 1,731,269; 1,826,773; 2,261,744; 2,311,139; 2,327,870. British Patent 442,859. Iron and Steel, June, 1944, pp. 701–505. Z. Elektrochemie 7, 723 (1901).

No. 2,469,015, May 3, 1949—Method and Composition for Producing Surface Conversion Coatings on Zinc—Jesse E. Stareck and L. M. Corliss, assignors to United Chromium, Incorporated.

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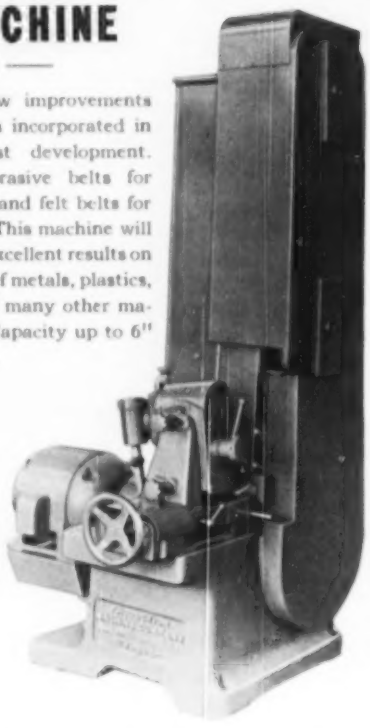

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Surface conversion coatings produced in chromic acid and chromate solutions have been known and used. Notable instances of such prior uses have been the production of surface conversion coatings on magnesium and on zinc . . . The method which has been generally used with zinc is that described in volume 81, Trans. Electrochem. Soc., p. 354, as the "Cronak" treatment. This method is one in which zinc is dipped in a solution of sodium dichromate containing sulfuric acid. The disadvantages of said method are limited abrasion resistance, lack of color uniformity, and slowness of the conversion coating in hardening. A late review (1942) of the prior art is found in an article by Edwards, "Anodic and Surface Conversion Coatings on Metals", volume 81, Trans. Electrochem. Soc., p. 341.

According to the present invention, surface conversion coatings are obtained on zinc and on other metals which are very adherent, so much so that they are not detached by sharp bending and will withstand cutting and shaping operations on the metal.

Examples of baths and modes of procedure in carrying out the method, according to the invention, follow:

EXAMPLE 1. SULFATE-RADICAL TYPE

Bath solution	
$Na_2Cr_2O_7 \cdot 2H_2O$	200 g/l
Na_2SO_4	5.0 g/l
*p*H	3–4.5
Current density	3–30 asf
Temperature	70° F

EXAMPLE 2. FLUORIDE-RADICAL TYPE

Bath solution	
$Na_2Cr_2O_7 \cdot 2H_2O$	175 g/l
Na_2CrO_4	25 g/l
Na_2SiF_6	excess of solubility
$SrSO_4$	excess of solubility
*p*H	5.5–6.0
Current density	3–30 asf
Temperature	70° F

EXAMPLE 3. SULFATE-RADICAL TYPE

Bath solution	
$Na_2Cr_2O_7 \cdot 2H_2O$	300 g/l
$KCr(SO_4)_2 \cdot 12H_2O$	2.5 g/l
$CaSO_4 \cdot 2H_2O$	excess of solubility
$CaCrO_4$	1.6 g/l
CrO_3	1.0 g/l
*p*H	3.0–4.5
Current density	3–40 asf
Temperature	70° F

CLAIM 6. A method of producing surface conversion coatings on metals of the group consisting of zinc, tin, lead, copper and silver, consisting essentially of passing electric current to an article having a metal surface of said group connected as anode immersed in an aqueous bath solution having as its essential constituents a water soluble alkali-metal chromate and a water soluble compound containing auxiliary radicals

of the group consisting of SO_4, F, SeO_4, SiF_6 in the respective weight proportions Cr^{VI}/SO_4 = 10:1 to 30:1, Cr^{VI}/SeO_4 = 10:1 to 30:1, Cr^{VI}/F = 50:1 to 150:1 and Cr^{VI}/SiF_6 = 20:1 to 60:1, and having a *p*H between 2 and 7.

CLAIM 7. A method according to claim 6 further characterized by the bath solution having room temperature and the current density being between 2 and 50 amperes per square foot.

10 claims.

References cited: U. S. Patents 1,853,323; 1,942,469; 1,953,999; 1,954,000; 2,021,592; 2,042,611; 2,091,386; 2,106,904; 2,177,392; 2,206,028; 2,224,528; 2,322,205; "Anodic Corrosion of Aluminum and Its Alloys", Department of Science and Industrial Research, London, England, 1926, pp. 6–7.

No. 2,469,689, May 10, 1949—Method of Making Apertured Metal Sheets—Donald C. Gresham, assignor to Eastman Kodak Company.

CLAIM 1. The method of making an apertured sheet of composite copper and nickel layers, which comprises forming in the same zone on both sides of a relatively thick imperforate copper sheet, nonconductive colloid stencils covering both sides of said copper sheet where said aperture is required, depositing on the parts of both sides of said copper sheet not protected by said stencils thin layers of nickel, then removing said stencils and making the copper sheet the anode in a copper plating bath and passing an electric current between said anode and a cathode until the copper at the parts of said copper sheet where the nickel is absent is removed to a greater width than the width of the aperture in the nickel foil.

CLAIM 2. The method according to claim 1 in which said stencil is composed of areas which are larger on one side of said copper sheet than corresponding areas on the opposite side of said sheet.

2 claims, 18 figures.

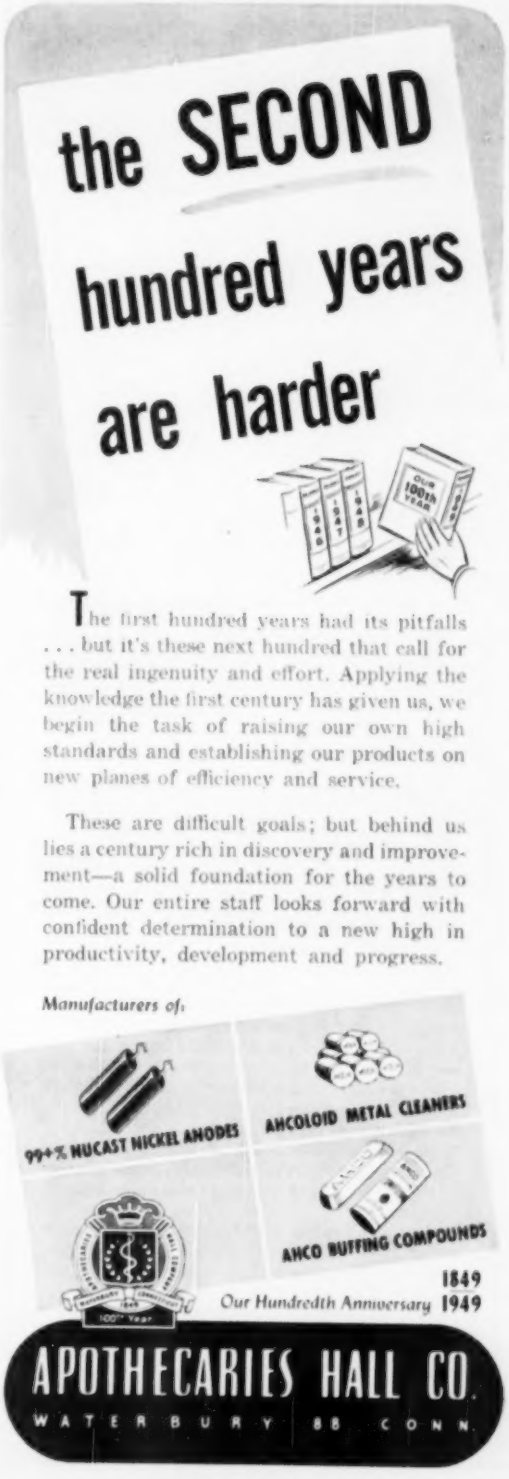
NOTE: The template cycle of 32 operations are found in the legend.

References cited: U. S. Patents 24,3783; 2,226,383; 2,282,203; 2,332,592.

No. 2,469,727, May 10, 1949—Electrodeposition of Nickel—R. A. Hoffman, assignor to E. I. du Pont de Nemours & Company.

The objects of the invention are attained by employing as an organic addition agent in nickel plating compositions, baths and processes a sultone. More specifically it has been found desirable to use 1-8-naphthosultone-4-sulfonic acid.

EXAMPLE III	
Nickel sulfate, g/l.	350
Nickel chloride, g/l.	15
Boric acid, g/l.	35
1,8-naphthosultone-4-sulfonic acid, g/l.	2
m-sulfobenzaldehyde, g/l	1
Temperature, ° C.	50
*p*H	3.8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CLAIM 2. A nickel plating composition consisting of a nickel compound selected from the group consisting of nickel sulfate, nickel chloride and mixtures of nickel chloride and nickel sulfate and 1/200 to 1/50 parts by weight of 1,8-naphthosultone-4-sulfonic acid.

6 claims, 6 examples.

References cited: U. S. Patents 2,112,818; 2,330,529; 2,359,730.

No. 2,469,947, May 10, 1949—Production of Extremely Thin Filaments—F. G. Brockman and J. W. Wescott, assignors to Socony-Vacuum Oil Company.

CLAIM. In a method of producing an extremely thin nickel filament by plating nickel on copper foil to a thickness of 0.1 micron, cutting the plated foil to form a ribbon having the length and width of the desired finished filament, and dissolving the copper foil from the nickel filament by submerging the composite ribbon in a bath formed of an aqueous solution of a cyanide of an alkali metal, the improvement which comprises securing the ribbon to a platinum frame in conducting relationship therewith before it is submerged in the bath to form a voltaic couple, whereby on submerging the frame and ribbon in a bath the copper will be dissolved, and bubbling occasioned by liberation of hydrogen during dissolution of the copper will occur only at the platinum electrode of the voltaic couple.

1 claim, 3 figures.

References cited: U. S. Patents 771,340; 865,688; 909,831; 1,709,801; 1,787,139; 2,052,962. "A Comprehensive Treatise on Theoretical and Inorganic Chemistry", by J. W. Mellor, Vol. III (1923), pp. 502-503.

No. 2,473,923, June 21, 1949—Electrolytic Polishing Process—D. R. Turner, assignor to Westinghouse Electric Corporation.

The electrolyte to be applied to the silver surface (by silver it is meant silver metal and alloys composed of silver as the main constituent, both plated and solid) consists of at least 2 grams per liter of cyanide and sufficient of another more readily ionizable nonacidic compound to give good electrical conductivity to the solution. A solution composed of 32 grams per liter of potassium cyanide and 8 grams per liter of potassium hydroxide gave excellent results in practice. From 2 to 50 grams per liter of cyanide is suitable to accomplish the purpose of the invention. Various neutral salts and alkaline compounds may be added to the electrolyte in order to attain the desired electrical conductivity. As an example, with 32 grams per liter of potassium cyanide, 10 grams per liter of any of the following compounds gave excellent results: Ammonium chloride, sodium chloride, sodium carbonate, sodium bicarbonate, trisodium phosphate, sodium hydroxide, potassium hydroxide, potassium chloride, ammonium hydroxide.

CLAIM 2. The method of polishing members whose surfaces are composed of silver, comprising immersing the members in an aqueous electrolyte composed of

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from 2 to 50 grams per liter of alkali cyanide and from 5 to 100 grams per liter of another readily ionizable, non-acidic compound, passing through the members an alternating electric current having a frequency of from 0.1 cycle to 60 cycles per second and at a current density of from at least 100 amperes per square foot at 0.1 cycle per second to at least 800 amperes per square foot at sixty cycles per second up to a maximum of 5000 amperes per square foot applied for a period of from 5 to 30 seconds to electropolish the silver surfaces, and removing the member from the electrolyte when the current renders it anodic for frequencies of between 0.1 and 0.2 cycles per second.

2 claims, 1 diagram.

References cited: U. S. Patent 1,527,734. German Patent 225,873. French Patent 707,526. Trans. Electrochem. Soc. **81**, 199–211 (1942). The Metal Industry, April, 1910, p. 175; June, 1921, p. 255. Chem. Abs. **37**, 2997 (1943). "Protective Coatings for Metals" by Burn *et al* (1939), p. 229.

No. 2,474,092, June 21, 1949—Composition for and Method of Electrodeposition of Lead—A. W. Liger, assignor by mesne assignment to Battelle Development Corporation.

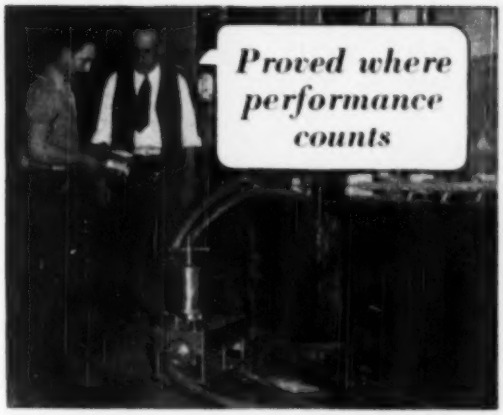
I have found that lead electrodeposits having the desired characteristics can be obtained from a bath having a composition within the following range:

	Grams per liter
Lead	30–95
Rochelle salt	20–75
Sodium hydroxide	90–360
Addition agent	0.2–1.5

In general, in the absence of a relatively high degree of bath agitation, I prefer to operate at a current density of from 20 to 30 amperes per square foot. However, current densities as low as 5 amperes per square foot may be used and, as is hereinafter disclosed, much greater current densities, for example 400 to 500 amperes per square foot or even higher, may be preferred for certain applications if sufficient bath agitation is provided. For most work I prefer to employ a bath temperature of between 140° and 190° F. However, under certain conditions, temperatures of from 125° F. or lower, up to approximately the boiling point of the solution, may be used.

The concentration and composition of the addition agent also can vary over relatively wide limits. In general, I prefer to use from about 0.2 to approximately 1.5 grams per liter of bath of an alkaline-stable organic surface-active agent. Such agents as du Pont RH 556 and du Pont TLF 41 . . . and stearyl trimethyl ammonium bromide are applicable . . . triethanolamine is also quite effective. Betaines or their derivatives . . . are particularly applicable . . .

Claim 1. An alkaline electrolyte suitable for the deposition of dense, adherent lead electrodeposits, said electrolyte containing from 30 to 95 grams per liter of dissolved lead, from 20 to 95 grams per liter of a



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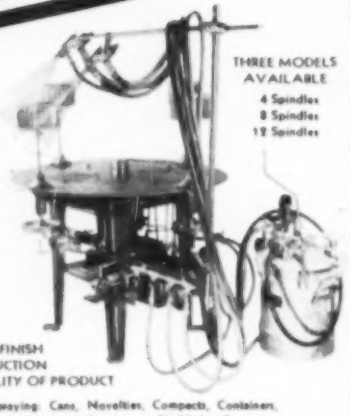

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salt of an aliphatic hydroxycarboxylic acid, alkali equivalent to from 90 to 360 grams per liter of sodium hydroxide, and from 0.2 to 1.5 grams per liter of betaine, the balance of said electrolyte being primarily water.

5 claims, 2 figures, 4 tables.

References cited: U. S. Patents 1,619,835; 2,048,594; 2,107,806; 2,255,057. Trans. Electrochem. Soc. **23**, 175 (1913); **38**, 121 (1920).

No. 2,474,181, June 21, 1949—Anodic Coating of Magnesium—H. K. DeLong, assignor to Dow Chemical Company.

Carefully cleaned articles of Dow Metal X-Alloy (a magnesium-base alloy containing 3.0 per cent aluminum, 0.2 per cent manganese, and 3.0 per cent zinc, the balance being magnesium) were immersed in a water solution containing 100 grams of lithium hydroxide per liter and 200 milliliters of ethylene glycol per liter, the solution being maintained at a temperature of 70° C. A direct current potential of 5 to 8 volts was then applied to the articles using an iron cathode, causing current to flow at a density of 15 amperes per square foot. Anodization in this manner was carried out for 30 minutes, after which the articles were removed from the bath, washed and dried. They were covered with a thin, dense corrosion-resistant gray film which had an abrasion resistance of 88 grams, as measured with a Haueisen abrasiometer [see H. G. Arlt, Proc. Am. Soc. Testing Materials **40**, 967 (1940)] using Aloxite powder and an air pressure of 12 ounces per square inch.

Claim 1. A method of producing a dense, thin abrasion- and corrosion-resistant coating upon articles of magnesium and magnesium-base alloys which comprises immersing the article in a solution consisting of water, an alkali-metal hydroxide in a concentration of at least 30 grams per liter of solution, and a water-soluble aliphatic hydroxyl compound selected from the group consisting of methanol, ethanol, ethylene glycol, propylene glycol, glycerol, mannitol, 2-ethoxyethanol, and diethylene glycol in a concentration of between 50 and 500 milliliters per liter of solution, said solution being maintained at a temperature between 60° and 100° C, and subjecting the article while so immersed to anodic electrolysis at a current density of between 1 and 100 amperes per square foot and at a potential not exceeding about 10 volts.

Claim 2. A method according to Claim 1 wherein the alkali metal hydroxide employed is lithium hydroxide.

Claim 3. A method according to Claim 1 wherein the water-soluble aliphatic hydroxyl compound is diethylene glycol.

Claim 4. A method according to Claim 1 wherein the water-soluble aliphatic hydroxyl compound is ethylene glycol.

4 claims.

References cited: U. S. Patents 1,923,502; 2,229,252,

British Patents 294,237; 387,437; 429,341; 483,798; 513,837. German Patent 594,062.

No. 2,474,502, June 28, 1949—Metallization of Electrically Nonconductive Fabrics, Fibrous Materials, and Porous Materials—Charles T. Suchy, London.

The present invention differs fundamentally from all prior proposals known to us in that it involves as an essential the treatment of a material in such a way that its internal structure is impregnated with metallic particles so as to render it conductive while its surfaces are rendered as nonconductive as possible prior to the electrodeposition treatment. That is to say, the present invention is based upon the conception that, to attain success, one must proceed in the opposite direction to the teaching of the prior art and be sure that, prior to the electrodeposition treatment, while the internal structure of the material is rendered conductive, its surface or surfaces are rendered substantially nonconductive so that the growth of the electrodeposit commences within the structure and beneath the surface or surfaces and becomes interlocked with the structure of the material, and only if the electrodeposition process is continued sufficiently long will the surface or surfaces ultimately become covered.

CLAIM 4. Process for the metallization of electrically nonconductive fabrics, fibrous materials and porous materials, which process comprises immersing the material in a stannous chloride solution, rendering the internal structure of the pretreated material electrically conductive by immersing the material in a colloidal silver solution to which is added a reducing solution to deposit metallic silver within the internal structure of the material; thoroughly drying the material and brushing the surface thereof to rid the same of any metallic silver deposited thereon and restore the surface of the material to its initial nonconductive state; and with the surface of the material in this nonconductive state, subjecting the material to electrodeposition in an electrolytic bath, drying to rid the material of all moisture, and then polishing to close the pores of the electrodeposited metal.

References cited: U. S. Patents 675,413; 997,610; 1,096,177; 1,118,675; 1,342,198; 1,452,281; 1,547,408; 2,303,871; 2,352,968. British Patent 5,022.

No. 2,477,808, August 2, 1949—Electrolytic Apparatus for Treatment of Moving Strip—Carl C. Jones.

CLAIM 5. Apparatus for progressively subjecting a moving strip to electrolytic action comprising a drum supported for rotation about a fixed axis and constituting a contact element for the strip beneath the surface of a liquid electrolyte, a tank for holding the electrolyte, means for passing the strip partially about a periphery of the drum in contact therewith and with said electrolyte, a series of curved electrodes partially embracing the drum each having a plurality of spaced ports directed inwardly toward the axis of curvature

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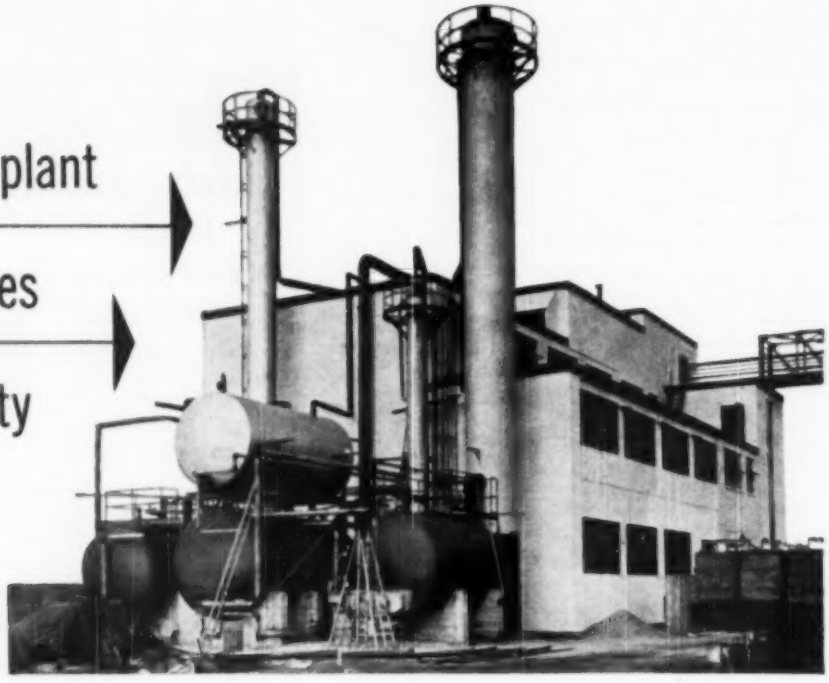

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of the electrode and a passge communicating with the ports of the electrodes respectively conforming substantially to arcs of more than 90° on radii greater than that of the drum and tubular supporting means for the electrodes positioned adjacent to the drum and supporting the electrodes for oscillatory movement in laterally spaced planes toward and away from the drum about a common axis parallel to the drum axis and lying adjacent and radially outwardly spaced from the path of the strip about the drum, said tubular means having spaced outlets each conforming to and positioned to register with one end of the passage in a corresponding electrode for introducing electrolyte into the electrode passage for projection through the electrode ports toward said path when the electrode is at the inner limit of its permissive movement, communication through said outlet being progressively restricted as the electrode is moved toward the outer limit of its said movement.

5 claims, 8 figures.

References cited: U. S. Patents 895,163; 951,365; 1,412,909; 1,811,409; 1,971,441; 2,271,735. British Patents 419,391; 547,312.

No. 2,478,189, August 9, 1949—Production of Malleable and Annealable Nickel—A. M. Gronningsaeter, assignor to Falconbridge Nickel Mines, Ltd., Toronto.

CLAIM 1. In the method of producing malleable and annealable nickel cathodes substantially free of pits and berries and with smooth surfaces by electrolytic deposition directly from electrolytes of nickel refining operations of the Hybinette type employing a cathode suspended in a porous cathode bag, the steps which comprise subjecting an acidified highly purified aqueous nickel plating electrolyte containing in excess of 25 grams of nickel per liter with a *p*H of 1.5 to 4 at a temperature of 40 to 80° C to electrolysis at a current density of 0.5 to 5 amperes per square decimeter, said electrolyte being substantially free of lead, arsenic and organic matter, and introducing a myriad of minute air bubbles within and at bottom of said cathode bag along the entire width of the cathode, said minute air bubbles being sufficient in amount as they rise along the surface of the cathode to stir the nickel electrolyte next to the cathode so vigorously with surrounding electrolyte in the bag as to prevent the adherence of pit- and berry-forming hydrogen gas bubbles and berry-forming solid impurities on the cathode and to prevent the electrolyte next to the cathode from becoming sufficiently basic to form objectionable berry-forming impurities on the cathode.

CLAIM 2. Method according to preceding claim, in which the nickel electrolyte has a *p*H value of 1.5 to 3.5 and a temperature of 50 to 70° C, and a current density of 1 to 2 amperes per square decimeter is employed.

4 claims, 5 figures.

References cited: U. S. Patents 1,249,787; 1,280,231; 1,395,827; 1,754,125; 1,986,967; 2,001,385; 2,066,347; 2,115,019; 2,153,569; 2,259,046. British Patent 543,294. Trans. Electrochem. Soc. 59, 390 (1931).

No. 2,479,317, August 16, 1949—Control System—W. G. Cook, assignor to Westinghouse Electric Corporation.

CLAIM 11. A control system for use with electroplating apparatus wherein a strip of conductive material to be plated is moved through an electroplating cell at varying speeds comprising circuit means including a plurality of rectifier means supplying a direct current to the strip of material from an alternating current source, saturable reactor means connected to control the alternating current input to each of the rectifier means, said reactor means having control windings, circuit means connected to effect base energization of the control windings in accordance with the speed of the strip material, a booster generator connected to vary the energization of the control windings from said base energization control means disposed to produce a voltage proportional to the speed of the strip of material, current transformer producing a control voltage proportional to the alternating current input to the rectifier means from the alternating current source, and sensitive electronic regulating means responsive to voltages from the control means and the current transformer means connected to control the output of the booster generator to effect vernier control of the current supplied to the strip of material and maintain predetermined relations between the current supplied to the strip of material and the speed of the strip of material.

11 claims, 2 figures.

References cited: U. S. Patents 1,068,411; 1,668,711; 1,961,197; 1,965,399; 2,064,589; 2,322,130; 2,325,401.

No. 2,749,323, August 16, 1949—Plating Machine—J. V. Davis, assignor to The Udylite Corporation.

CLAIM 7. In an electrolytic plating apparatus, a tank adapted to contain the electrolyte, a frame having one end pivotally mounted above and adjacent to said tank and its swinging end disposed directly over said tank, a cross shaft rotatably carried by said swinging end, a work container fixed to said shaft and a perforate anode basket pivotally suspended from said shaft, said basket normally lying within said container, a lever fixed to said cross shaft for rocking said container, a power shaft, a crank thereon, a telescopic rod having a section connected to said crank and another section connected to said lever, a latch on the first section adapted to lock on said lever to control the telescopic action of said rod, a guide member above said cross shaft, a chain connected to said cross shaft and passing over said member for raising and lowering said shaft and swinging said frame, a rotatable drum to which said chain is applied for winding a clutch between said drum and said power shaft, and a cathode contact extending into said working container.

7 claims, 14 figures.

References cited: U. S. Patents 610,907; 626,361; 1,734,909; 1,894,609. British Patents 342,477; 508,095.

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The parts are placed in a closed bowl which has a fairly tight-fitting cover and is filled with enamel. When rotation is started, the outflow of enamel from the bowl and parts is restricted to cause a hydrostatic pressure to be built up against the parts by the enamel. This pressure forces the coating material into every surface pore. As the speed of rotation is increased, the parts are centrifugally drained to remove excess enamel, leaving an even coat. The thickness of this coat can be controlled by the elapsed time of spinning, an average of usually 10 to 20 seconds.

The machine has a removable liner to permit ease of cleaning and rapid change to a different color. For further information, use Reader Service Card.

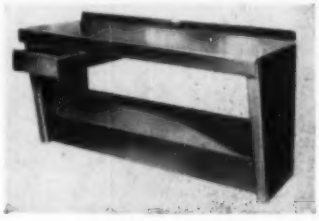
E—336. Compressed Air Cleaner—Water and water-oil emulsions are removed automatically and continuously from compressed air lines by the newly designed Liqui-jector, a product of Selas Corporation of America, Erie Avenue and D Street, Philadelphia 34, Pa. This is accomplished with two ceramic tubes, one of which is water-repellent, the other water-permeable but air-impervious. Compressed air passes through the first tube where it is stripped of its aqueous contamination and dirt. Moisture drops to the bottom and drains through the second tube without loss of air. The water ejection rates for the three sizes of equipment vary from 0.5 to 2.5 gallons per 24 hours.

The Liqui-jector acts also as a filter, removing atmospheric dirt and finely divided solid particles, even finer than 100 microns in diameter. For further information, use Reader Service Card.

E—337. Plastic Sheeting—"P.E." Sheeting, 6-inch wide by 0.004 inch thick, furnished by M. E. Baker Company, 25 Wheeler Street, Cambridge 38, Mass., is used to eliminate anode-rod and anode-hook maintenance. Wrapped around anode rods it will protect rods and hooks against corrosion due to dragout or spray, insuring clean contacts for several months without cleaning according to recent plant tests where daily maintenance was necessary before using "P.E." The sheeting is secured to the anode rod at intervals with "Scotch Brand" Electroplaters' Tape or any impervious tape or material. It is packaged in 100-foot rolls, but any amount may be purchased. For further information, use Reader Service Card.

E—338. Still-Degreaser—The newest addition to the line of degreasers and stills manufactured by Phillips Manufacturing Company, 3475 W. Touhy Avenue, Chicago 45, Ill., is Model ST-1, a combination 5-gph still and degreasing machine. It is electrically heated and is comprised of two compartments: the first heated with strip heaters to boil the solvent, the vapors flowing over to the second compartment where they are condensed by a small cooling coil. Its distillation rate of 5 gph will vary slightly depending on whether trichlorethylene or perchlorethylene is used. There is a thermostat in the boiling sump to prevent overheating in case of excessive contamination. The inside dimensions of each department are 14 inches x 15 inches with 11 inches of working depth.

E—339. Steel Work Bench—A new 6 feet long, 34 inches high, and 28 inches deep work bench, announced by Equipto, Division of Aurora Equipment Company, Aurora, Ill., is said to be extra strong, made for the heaviest industrial uses with a 12-gauge steel top. The legs are sloped



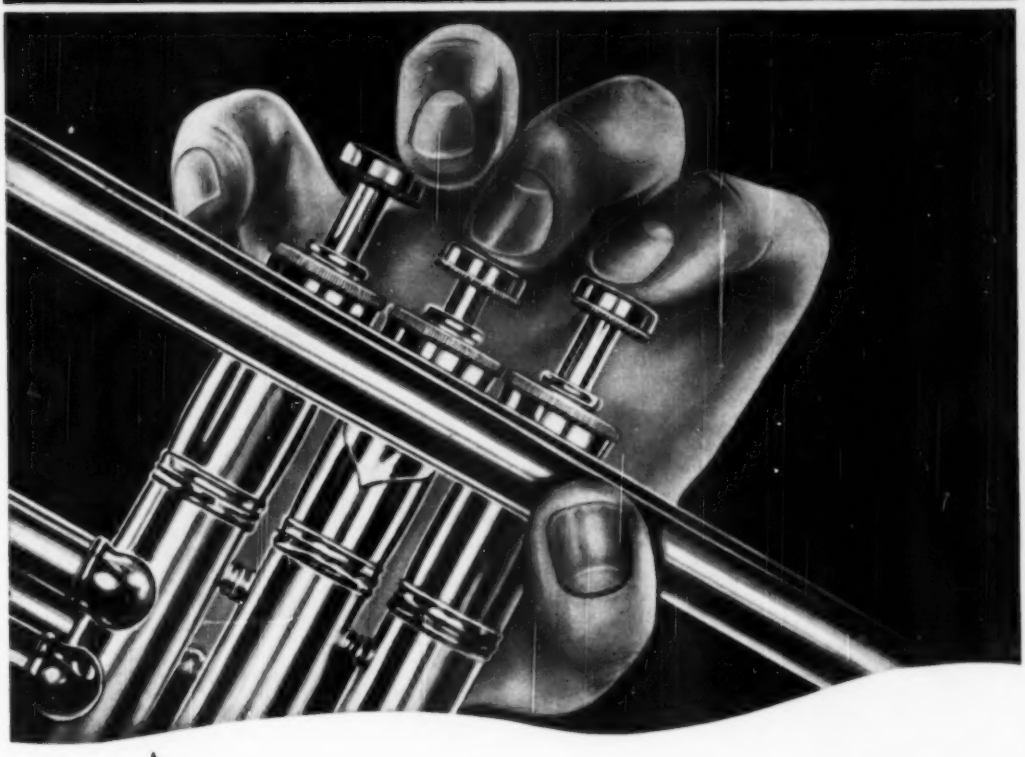
back so that there is no stumbling; electrical knockouts for double outlets are provided in the front of each leg just below the top; back rails keep items from rolling off the top or shelf of bench; drawer is pilfer-proof and mounted on rollers; full base to floor keeps dirt and refuse from accumulating underneath; bench may be bolted to the floor through concealed holes inside flange of end panel if desired.

Standard finish is olive green enamel with any colors optional. For further information, use Reader Service Card.

E—340. Metal Cleaner—A new, improved high-conductivity cleaner for reverse current cleaning of zinc-base die castings prior to electroplating has been announced by the Special Chemicals Division, Pennsylvania Salt Manufacturing Company, 1000 Widener Building, Philadelphia 7, Pa.

Marketed under the name of Pennsalt Cleaner Z-54, it is composed of anhydrous alkaline ingredients plus a combination of synergistic surface active agents. Usually

SEYMOUR NICKEL SILVER



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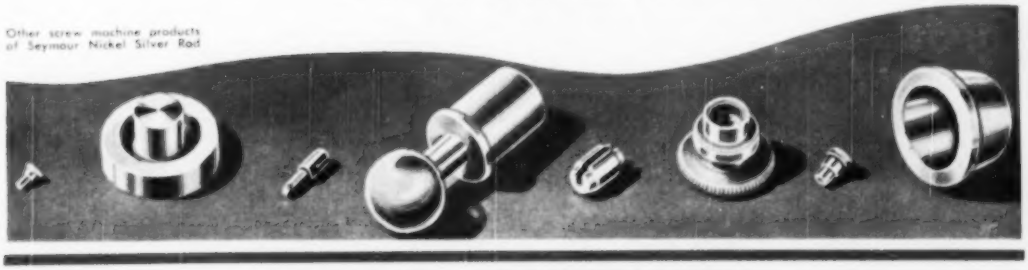
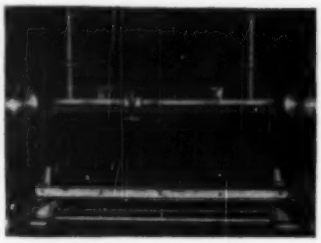
Other screw machine products of Seymour Nickel Silver Rod



Equipment and Supplies

employed following pre-cleaning by spray washing, emulsion cleaning, or vapor degreasing, it is used at the recommended concentration of 5 oz/gal and 180–190° F. Substantial reduction in blistering has been reported by initial users of the product. For further information, use Reader Service Card.

E—341. Abrasive Belt Polisher—The Curtis Machine Corporation of Jamestown, N. Y., is the producer of an abrasive-belt polishing and grinding machine that has many and varied applications. It comes in two parts, the abrasive belt unit and a table unit, but can be purchased without the latter. The belt unit



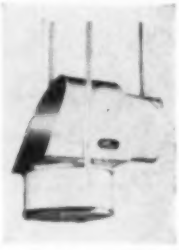
is suspended from the ceiling and is adjustable vertically by a motorized unit on two telescoping tubes. In some instances these units have been suspended over an assembly line for grinding or polishing large surfaces. It is available in standard 6-, 8- or 10-foot lengths and in single- or double-belt style. The double belt machine will permit the use of a coarse abrasive for stock removal and a finer abrasive for finish polishing. The traveling head permits sanding of large areas with speed and a minimum of operator fatigue.

Among applications are flat sheets, show case equipment, store fronts, and metal cabinets. For further information, use Reader Service Card.

E—342. Dust Collector—Recent improvements in Model 420 Dustkop dust collector to permit its use on polishing, buffing and grinding operations involving larger wheels and bigger volumes of dust are announced by Aget-Detroit Company, 375 Main at Washington Streets, Ann Arbor, Mich.

The original 12 x 20-inch floor space and the overall height of 24 inches remain unchanged, the new ratings being due to the combined use of a 1.3-hp motor direct-driving a special hi-static paddle-wheel fan developed especially for this model. Ratings, based on instrument test, are 437 cfm on a 4-inch inlet pipe; static suction of 3.2 inches water with a velocity of 7,300 fpm and 3-inch inlet pipe, more than required to convey heavy dusts. The standard cyclone separator which is built into the unit and the second-stage filter of spun glass which gives the air a final cleaning before returning it to the working space are both continued. For further information, use Reader Service Card.

E—343. Humidifier—The addition of a new Model 30 to the industrial line of Walton Humidifiers has been announced by the Walton Laboratories, Irvington 11, N. J. It evaporates approximately three gallons of water per hour. Electrical



consumption is approximately 230 watts, and all that is needed is connection to a city water supply and electric current. Elimination of compressors, air or drain piping, and duct work, is an important feature.

The unit may be used in multiple to provide uniform, controlled humidity conditions in an enclosure, or singly for "spot" humidification or for boosting the humidity obtainable from existing systems. For further information, use Reader Service Card.

E—344. Protective Coating—Murray Products, Inc., 12400 Crossburn Avenue, Cleveland 11, Ohio, sales division of the

PAYS FOR ITSELF... *IN TIME SAVED*

Kreider Dryer with auxiliary steam heating unit (illustrated). Auxiliary natural gas heating unit available, also standard model without auxiliary heating.

Basket (below). Heavy gauge woven steel mesh over steel frame. Capacity, 1140 cu. ins.

Spin-Dries' up to 50 pounds in less than 2 minutes

Saves drying time. Kreider Dryer operates on ¼ h.p. at 625 r.p.m. . . . cuts drying time to as little as 35 secs. — no more than 2 mins. — for each 50 lbs.

Saves production time. Runs at top speed with maximum load, hour after hour, day after day. Ends drying "bottle necks" . . . assures smooth, evenly dried surfaces, longer lasting lustre — fewer "rejects."

Saves maintenance time. Simple, sturdy construction reduces "time-outs" for repairs and servicing to a minimum. Assures long life.

See for yourself! Write Department PL 10 today for illustrated 4-page folder . . . also addresses of installations near you.

New Holland Machine Co., New Holland, Pa.

"Only 2 simple steps required. . .

(1) Operator places wire mesh basketful of small parts in Dryer . . . turns motor "ON."

(2) Operator turns motor "OFF" . . . presses foot brake . . . removes basket.

NEW HOLLAND *KREIDER* DRYER

Equipment and Supplies

Poly-Cyclo Products Company announces a new coating system, Cyclon Series "WPS", for the protection of all types of metals that are subjected to extreme corrosive conditions, particularly to direct immersion.

Essentially formulated from basic vinyl plastic resins, the new coating is said to adhere tenaciously to all types of metallic surfaces, usually without sandblasting or similar precleaning. Adhesion is secured by chemical inner-reaction of the Cyclon "WPS" Primer with the metal surface, providing high bond strength even to zinc, lead, cadmium, aluminum, nickel, copper, stainless steel, galvanized metals, and magnesium.

Completing the system, a Tie Coat and a final Top Coat are used. The former has been formulated to unite the primer with the top coating. However, it in itself has good chemical resistance and when used over the primer it is recommended for general maintenance applications. The Top Coat is compounded of the most inert thermoplastic resins with chemically resistant virgin pigments and other inactive ingredients.

Whether applied by brushing, spraying or by dipping, Cyclon "WPS" Coatings are said to have an exceptionally high solids content resulting in greater coverage per gallon and a heavier film per coat. They air dry in a matter of minutes by solvent evaporation. For further information, use Reader Service Card.

E—345. Coating Thickness Gage—The Lea Manufacturing Company, Waterbury, Conn., announces the Lea Lectromag (Lipson patent pending), an instrument for measuring the thickness of non-magnetic coatings on carbon steel or iron. The instrument is said to be capable of measuring coatings from 0.0002 to

0.008 inch thick with a ±10 per cent accuracy for 0.001 inch and over and ±15 per cent accuracy for lesser thicknesses. Its small size, compactness and portability make it very useful for plant use.

Essentially, the Lectromag consists of a solenoid about 5 inches long encased in a cast-plastic holder, a 3/16-inch diameter glass tube with indicating scale, a soft iron core with marker within this tube, and suitable leads and connections to 110 volt, 60-cycle a.c. For further information, use Reader Service Card.

E—346. Self-contained Packaged Plating Machine—The W. S. Rockwell Company, Fairfield, Conn., announces the Cro-Plater, a complete plating unit, fully

wired and ready for operation on delivery. There are no installation expenses beyond supplying current to the machine.

Designed primarily for all types of chromium plating, it is provided with a lead-lined 45-gallon Armco iron tank. It can deliver any required amperage up to 300 at 1–15 volts with precision control of both current and temperature. The unit is equipped with a blower which not only exhausts the fumes from the tank, but force-cools the copper-oxide rectifier. It requires a 220-volt, 3-phase, 60-cycle, 50-ampere input.

The Cro-plater can be used for other metals besides chromium, where the standard lead-lined tank is suitable. Plain steel, rubber-lined, or other types of tank construction can be provided in special units.

One of the most important fields of application is said to be the small shop. It will also find use for departmental plating and for pilot plant investigations. Accessory equipment is available, includ-

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BLACK-MAGIC, a simple, inexpensive, one-bath black oxidizing process for steel, is way out in front because of highest quality materials, engineering skill, and prompt, efficient service. We have products and processes for coloring steel, iron, brass, copper, zinc and cadmium, metal cleaners, rustproof coatings and dips and metal treating salts.

Quick-Carb carburizing salts, Quick Temper tempering salts and Neutral salts perform fast and efficiently over all required temperature ranges.

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MODERN METAL FINISHES
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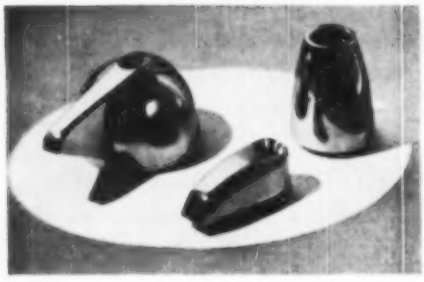
WITCH-DIP & WITCH-OIL FINAL FINISHES

DILCO Gloss-Seal PROTECTIVE COATING
HEAT TREATING SALTS, CLEANERS, ETC.

PREVENT Blistering, Streaking
on zinc-base die-castings

with DIVERSEY No. 505

Sensational NEW
ELECTRO-CLEANER AND SURFACE CONDITIONER!



Designed especially for reverse current electro-cleaning of zinc-base diecastings, *new* Diversey No. 505 completely, *safely* removes all unwanted deposits! In addition, Diversey No. 505 helps condition the surface of the zinc, providing better adhesion between the electro plate and the base metal!

This unique, double-action of Diversey No. 505 helps provide a uniformly clear, brilliantly lustrous finished surface . . . one free from blistering, peeling and streaking! Diversey No. 505 is economical, easy to use and available now! Investigate Diversey No. 505!

For complete information on Diversey No. 505

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Title_____
Company_____
Address_____
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Equipment and Supplies

ing a vapor degreaser and a cleaning unit. For further information, use Reader Service Card.

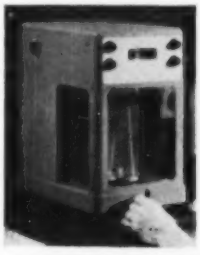
E–347. Metal Lacquer—The Stanley Chemical Company, East Berlin, Conn., as a result of a search for a lacquer to go on silver, has developed a water-white coating said to have excellent adhesion not only to silver, but also to brass, chromium, steel, iron, magnesium and zinc. Based on vinyl resins, it possesses outstanding resistance to tarnishing, soaps, acids and is perspiration-proof, according to the manufacturer.

This product, designated as No. 45X-70 Clear Gloss Synthetic, dries enough to be handled in about 20 minutes. For further information, use Reader Service Card.

E–348. Metal Cleaner-Paint Base—A chemical for cleaning metal and supplying an effective paint base is announced by Farrelboy Company, 1243 N. 26th Street, Philadelphia, Pa. The material, known as Farrelbok, combines chemically with the metal on spraying, dipping or brushing, hot or cold, to form a ductile coating of uniform phosphate crystals on steel, cast iron, or zinc-base alloys. No prior surface preparation is required except degreasing. For further information, use Reader Service Card.

E–349. Water Alkalinity Test Paper Set—A new test from the Development Laboratory of the La Motte Chemical Products Company, Towson 4, Md., employs a series of new test papers for differentiating between caustic alkalinity, carbonate alkalinity and bicarbonate alkalinity of water and solutions. A compact and inexpensive kit is available consisting of three vials of selected indicator papers which will quickly show whether the alkalinity of a solution is due to caustic, carbonate or bicarbonate. Complete instructions for using the papers are printed on the box. For further information, use Reader Service Card.

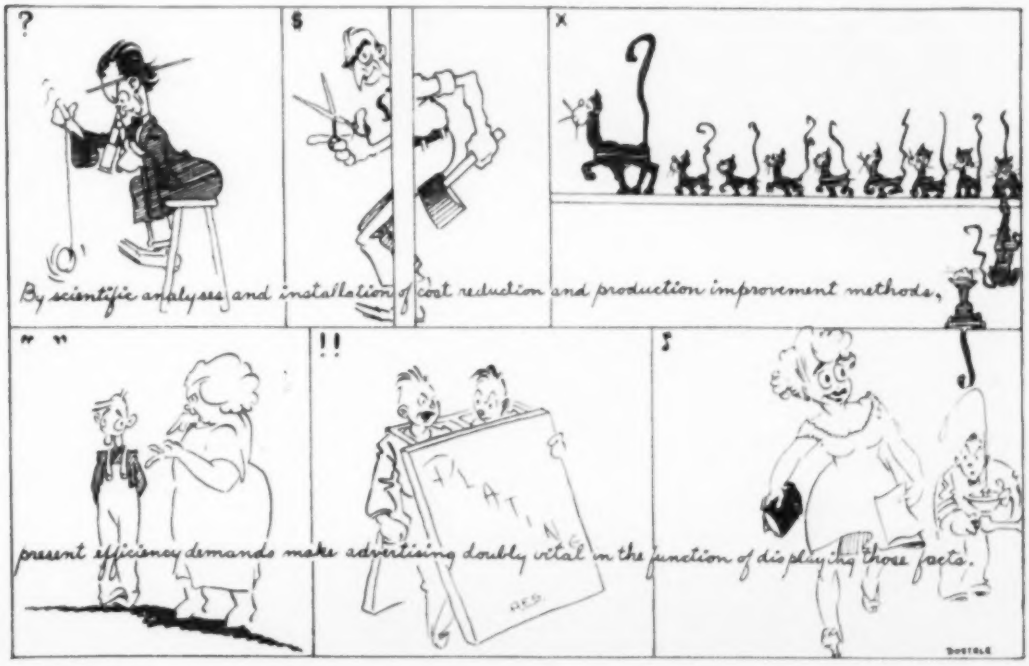
E–350. Laboratory Balance—Weighing to 1/20 of a milligram with analytical



balance accuracy but in one-third the usual time is made possible by a new direct-reading instrument, the "Gram-atic Balance", manufactured by Fisher Scientific Company, Pittsburgh, Pa.

The new balance has only one pan, and the weight reads directly on a scale at eye level, eliminating a usual source of error in adding up individual weights. The balance has all required weights built in and manipulated by turning four external knobs. No weights are handled, weights less than 0.1 gram are indicated optically and automatically. Total weight is read directly from a scale on the instrument panel. The samples to be weighed can range from 200 grams (approx. 7 oz.) to 0.0001 gram.

E–351. Buffing-Polishing Machine—A new buffing and polishing machine manufactured by Vanott Machine Corporation, 246 Colgate Avenue, Buffalo 20, N. Y., is said to provide greater movement for polishing large areas. The machine is available in three types, single-, four- and eight-spindle units, with the head swivelled automatically by depressing a foot lever. Movements at right angles are accomplished by two hand wheels. Range of vertical adjustments has been increased, and an automatic oscillating movement up to six inches is available. Chucks for holding the parts to be polished are custom-built to meet individual industrial specifications. Spindle speed is normally 24 rpm and can be set to stop automatically when the head


By scientific analyses and installation of cost reduction and production improvement methods,
present efficiency demands make advertising doubly vital in the function of displaying those facts.

Equipment and Supplies

swings away from the work. For further information, use Reader Service Card.

E—352. Self-Priming Vinyl-Base Protective Coating—The U. S. Stoneware Company, Akron, Ohio, has announced its Series "K" self-priming vinyl-base paint that adheres tightly to metal, wood, or concrete. The new paint was developed primarily to fill the need for an easily applied protective coating to resist corrosive conditions not sufficiently severe to warrant the use of the multiple-coat series of Tygon Paints. For normal conditions two to three coats of Tygon Series "K" are said to provide effective and long-lasting protection. They may be brushed or sprayed; they air-dry quickly or may be baked.

Non-oxidizing, non-inflammable when dry, they possess an upper temperature limit of approximately 200° F. They are available in black, white, clear, gray, red, green, and aluminum. For further information, use Reader Service Card.

E—353. Buffing Compounds—The Beacon Supply Company, 110 Marginal Street, Chelsea, Mass., announces the development of a new buffing composition called Violet Ray Compound. It is said to give faster cut, higher color, easier cleaning than any conventional compound previously marketed. The homogenized binder contains no animal, mineral or marine fats, grease or pitch. Combined with the proper abrasive for tripolis, lime finishes, stainless steel bars, and jewelers' rouges, it adheres to and penetrates the buffing wheel itself to insure more buffed pieces and less rejects. While it contains no added wetting or emulsifying agents, it cleans easily in a mild alkali solution. For further information, use Reader Service Card.

E—354. Valve with Plastic Diaphragm—The development of a new plastic diaphragm for use in diaphragm valves has been announced by the Hills-McCanna Company, 3025 North Western Avenue, Chicago 18, Ill. The new material is said to make possible the handling of 66° Bé sulfuric acid without the leakage, dripping or sticking problems generally encountered in valving this material. The Hills-McCanna Saunders Patent Valve is already widely used in a broad variety of corrosive services.

It is the plan of the company to furnish those valves in sizes ½ through 4 inches, with a choice of cast iron, cast steel, Durimet, or glass-lined bodies. All but

the glass-lined will be available with flanged or screwed ends, the glass-lined being available only with flanged ends. All sizes are suitable for pressures to 100 psi and temperatures to 125° F. For further information, use Reader Service Card.

E—355. Small Immersion Pump—The small immersion pump manufactured by Samuel S. Gelber Company, 162 N. Clinton Street, Chicago 6, Ill., may be hand operated or equipped with a float-switch control. It was developed for moving acid or alkali liquids and is said to be capable of handling hundreds of gallons at an operating cost of only a few cents. Some features are said to be: bearingless pump, only one moving assembly with nothing to wear out; self-cooling continuous-duty motor; double inlets at top and bottom to prevent clogging; silent operation; stainless-steel, ground-and-polished one-piece shaft; open impeller design to handle a reasonable amount of solid matter easily. It can be used in air conditioning, for general circulation purposes, coolant circulation, cellar draining and such other applications common to pumps in this size range. For further information, use Reader Service Card.

It will pay you to specify *SPEEDIE* Tripoli Compositions . . . For *SPEEDIE* Tripoli assures you a "laboratory-quality" composition. The faster cutting properties of a job-proved *SPEEDIE* Tripoli makes it most economical for buffing aluminum, brass, bronze and copper — die castings and stampings. Small and large shops alike choose among the many popular *SPEEDIE* Tripoli Compositions, ranging from the ever-popular No. 607, to No. 1014 for cutting and coloring in one, fast operation.

You may be seeking No. 1639 *SPEEDIE* Tripoli . . . A "natural" if you are having cleaning problems — *it readily emulsifies in hot water*, eliminating cleaners. If you are using liquid compositions, specify No. 1887 *SPEEDIE* "Spray-It" Tripoli — scientifically blended to stay in suspension. Learn more about the many other *SPEEDIE* products — Nickel Finish, Stainless Steel and Chrome, Grease Stick and Emery Cake —**Write Dept. P** for your FREE catalog, today!

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MICCROSOL

E-1003

HEAT-CURED RACK COATING

● Now, the MICCRO laboratories have developed a single-dip heat-cured rack coating that offers, in addition to positive insulation and protection: (1) amazing tensile strength and scuff resistance, (2) permanent flexibility, (3) positive and continuous adhesion, (4) simplicity of application, (5) savings in time, labor, and material . . . a major objective of chemical engineers for years. This new coating is MICCROSOL E-1003.

● MICCROSOL E-1003 is the exclusive product of Michigan Chrome and Chemical Company, developed and manufactured in our own plant with the same technical skill and knowledge that has made all MICCRO products outstanding in the plating industry.

● Look at the chart! This exhaustive test analysis reveals the marked superiority of MICCROSOL E-1003 in every important factor of comparison. In addition, tests for abrasion and resistance to all commonly used plating solutions, acids, and caustics show equally amazing results.

● MICCROSOL E-1003 is a 100% solids non-evaporating material that produces a smooth, tough, leather-like coating with a single application that will often outlast the life of the rack. Racks are completely processed and ready for use in approximately 2 to 4 hours.

● For further information write for detailed bulletin on Miccrosol E-1003.

YOU ASK FOR FIGURES? HERE THEY ARE!

Comparison of MICCROSOL E-1003 with three other well-known coatings.

Tests	Miccrosol E-1003	Coating A	Coating B	Coating C
Tensile Strength	3400#	2600#	2000#	1600#
Adhesion	125#	40#	25#	35#
Hardness Durometer "A"	80-85	70	52	50
Tear Strength	650#	450#	350#	250#
Elongation	250%	350%	400%	450%
Recovery	99%	99%	99%	100%
Solids	100%	100%	100%	100%

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gives galvanized parts

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RUST PROTECTION

A clean, sanitary appearance and freedom from corrosion are "musts" inside this beverage cooler manufactured by The Vendo Company, Kansas City, Missouri. That's why Iridite was chosen to finish hardware parts and the galvanized vending basket. Iridite stops galvanic corrosion because it forms protective barrier between dissimilar metals. Iridite blocks corrosion from moisture because it seals the metal from contact with condensed moisture.

3 WAYS TO USE IRIDITE

Iridite offers you a complete line of finishes for any zinc or cadmium surface . . . plated, die cast or galvanized, and for any finishing problem . . . corrosion resistance, paint base or eye appeal.

SIMPLE TO OPERATE

You'll find Iridite easy to use, too. It requires no special equipment or personnel, goes on with a short, non-electrolytic dip, dries fast and gives uniformly good results from manual or automatic application.

If you use zinc or cadmium in any form, you can use Iridite. Write today for data and samples, or, send specimens of your product for FREE IRIDITE PROCESSING. *Special note:* Ask about Iridite Bright for zinc or cadmium-plated parts. See how you can get durability and chrome-like brightness at amazing low cost.

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Trade Literature

L—271. Bright Zinc Plating in Barrels—Technical instructions on the BBZ-200 Process for bright zinc plating in barrels are covered in a new manual issued by the Hanson-Van Winkle-Munning Company of Matawan, N. J. The features of this process are said to be high brightness, bright dipping not essential, extremely low brightener concentration and consumption, low operating cost, high current densities, noncritical operation and control, special equipment not required, excellent covering power, ready acceptance of conversion coatings, relatively high solderability, and use of nonsludging ZA alloy anodes.

The manual describes in detail preparation of solution, conversion of existing solutions, effects of constituents, solution operation and control, maintenance, effects of impurities, voltage, temperature, anodes, thickness of zinc deposit, rinsing, bright dipping and drying, equipment requirements, and lastly, plating of gray and malleable iron castings in barrels. For your copy, use Reader Service Card.

L—272. Polishing Machinery—Hammond Machinery Builders, Inc., 1610 Douglas Avenue, Kalamazoo, Mich., have just announced release of a 24-page Catalog No. 60 covering polishing, buffing, grinding, and deburring machinery. It describes and illustrates new and improved polishing lathes; backstands for abrasive belts to be used with polishing lathes; improved OD-finishing machines for tubes, bars and cylindrical stock; contour-finishing machines for odd or irregular shapes; and the new line of 10 Junior Automatics for use in conjunction with polishing lathes or abrasive belt machines. For your copy, use Reader Service Card.

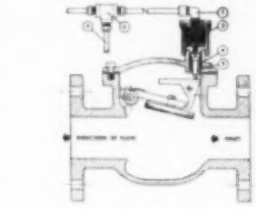
L—273. Electric Ovens for Curing Plating Rack Coatings—Accurately controlled temperatures necessary for effective curing of plating rack coatings are said to be maintained in the electric ovens developed by the Belke Manufacturing Company, 947 N. Cicero Avenue, Chicago 51, Ill., and described in Bulletin 1061.

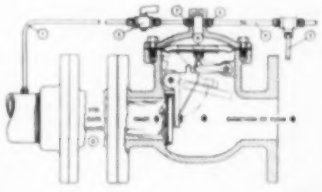
Temperature is maintained at any preset value between 300 and 400° F by the automatic control. Other temperature ranges can be furnished if specified. The ovens are insulated all around with three-inch thick glass wool to conserve heat. Easily replaceable, long-service Nichrome "S" heating elements are mounted on the bottom and side walls for uniform heating. For your copy, use Reader Service Card.

L—274. Filters—Titeflex filters, which feature a backwashing system for ease of cleaning, are illustrated and described in a new 12-page booklet published by Titeflex, Inc., 722 Frelinghuysen Avenue, Newark 5, N. Y. Included are details of construction, diagrammatic drawings showing how the filters operate, and information on the stone membrane and the wire-mesh membrane. Individual insert sheets setting forth filtering recommendations for particular industries will soon be available. For your copy, use Reader Service Card.

L—275. Safety Valves—McRae Valve Corporation's, 620 S. Main Street, Los Angeles 14, Calif., two new "Sentry" valves, which provide automatic line control in the event of fire or other emergency, are described in a 4-page illustrated catalogue.

The Sentry Automatic "Instant-Closing" Shut-Off Valve (top) will close all gas, fuel-oil or other "hot" lines entering the danger area. A small tube in which a nominal pressure is maintained is connected to the valve and carried to any





part of the plant, and the self-operating valve mechanism functions automatically to close the valve whenever the seal on the control line is broken. This may be accomplished by fusible seals melted by fire or by explosion, by manual control, by power failure, or other means. As many control points as desired, of one or several types, may be placed in the single line to operate one or any number of valves concurrently.

The companion Sentry valve for "Instant-Opening" (bottom) automatically provides a deluge of water at full line capacity, directed to any critical area requiring instantaneous flooding. Both valves are self-contained, automatic units and are not dependent on outside power or manual control. For further information, use Reader Service Card.

A. S. T. M.-A. E. S. SPECIFICATIONS FOR PLATED COATINGS

All numerical requirements refer to minima on significant surfaces.

Zinc on Steel: A164

Coating	Type G.S.	Type L.S.	Type R.S.
Zinc, inch	0.001	0.0005	0.00015

Cadmium on Steel: A165

Coating	Type N.S.	Type O.S.	Type T.S.
Cadmium, inch	0.0003	0.0003	0.00015

Nickel-Chromium on Steels: A166

Coating	Type D.S.	Type F.S.	Type K.S.	Type Q.S.
Copper plus nickel, inch	0.0120[a]	0.00125	0.00075	0.0004
Final nickel, inch	0.0010	0.0006	0.0004	0.0002
Chromium (if required), inch	0.00001	0.00001	0.00001	0.00001
Resistance to standard salt spray, hours without appreciable corrosion	96	72	48	16

[a]When copper is used in excess of a thickness of 0.0001 inch, its minimum thickness shall be 0.00075 inch.

Nickel-Chromium on Copper and Copper-Base Alloys: B141

Coating	Type F.C.	Type K.C.	Type Q.C.
Nickel, inch	0.0005	0.0003	0.0001
Chromium (if required), inch	0.00001[a]	0.00001	0.00001

[a]Maximum thickness should be kept below 0.00005 inch to prevent cracking.

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Nickel-Chromium on Zinc and Zinc-Base Alloys: B142

Coating	Type F.Z.	Type K.Z.	Type O.Z.
Copper plus nickel, inch	0.00123	0.00073	0.0005[a]
Copper, inch	0.0004	0.0003	0.0002
Final nickel, inch	0.0003	0.0003	0.0003
Chromium (if required), inch	0.00001	0.00001	0.00001
Resistance to standard salt spray, hours without appreciable corrosion	48	32	16

[a]Total of 0.0003 inch if alternative of nickel only is used.

Lead Coatings on Steel: B200

Type	Copper inch	Lead inch	Salt spray Resistance[a] hours
E.S.	.....	0.0010	96
EE.S.	0.000015	0.0010	96
M.S.	.....	0.0005	48
MM.S.	0.000015	0.0005	48
P.S.	.....	0.00025	24
PP.S.	0.000015	0.00025	24

[a]To standard salt spray test in hours without appreciable corrosion.

Chromate Finishes on Zinc: B201

With two crossing, 1-inch long scratches through the chromate coating only, the part shall show no white corrosion visible to the unaided eye at normal reading distance after 24 hours in a standard salt spray test.

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. . Multiple Stage Cleaning is engineered to fit your sequence . .

To meet today's conditions in the plating and metal finishing industry, involving changes in polishing compositions, automatic polishing, heavier and faster production and dirtier work with packed recessed areas, we offer MULTIPLE STAGE CLEANING for proper surface preparation. Whether your equipment is manual or automatic, MULTIPLE STAGE CLEANING based on our well established "Lo-Hi" pH process can be engineered to fit the job. In case you are having any cleaning or plating troubles, fill in one of our Engineering Data Sheets, which the NORTHWEST man in your territory can supply you or write us direct. With this information, which includes your complete sequence, we will make our recommendation. . . .

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A. E. S. News

Addition to Branch Speakers List

BELKE MANUFACTURING COMPANY (c)
947 N. Cicero Ave., Chicago 51, Ill.
SIGMUND FARBY, Subject 1
RAYMOND KOTZ, Subject 2
HARVEY J. JOHNSON, Subject 3
Subjects:
1. *Plating Racks and Racking*
2. *Transfer Machine, Plating Barrels and Deburring*
3. *Racks and Plating Equipment*

Branch By-Laws

The following is being published at the request of the Society's Executive Board.

TO: All Branch Secretaries

Subject: *Branch By-Laws*

GENTLEMEN:

The Executive Board is responsible for determining that branch by-laws do not violate the laws of the Society as provided in the Constitution and By-Laws of the Society. The branches have been encouraged recently to prepare by-laws to govern the operations of the branches, and it is required that a copy of any branch by-laws be filed with the Secretary of the Society in order that the Executive Board may determine that the laws of the Society are not violated.

The Executive Board has recently used the services of Manson Glover of the Boston Branch, a member of the Law Committee of 1948–1949, to review the branch by-laws which have been submitted, and to advise the Executive Board regarding any possible conflict with the basic laws of the Society. Based on the information so received, the Board has instructed the Executive Secretary to communicate with the branches regarding their by-laws.

In all cases to date the branch by-laws submitted have not been in conflict with the basic laws of the Society, but in reviewing them it has become evident that while many strong ideas have been formulated with pains and care by the branches, there are points which shriek for amendment. These points are potentially the roots of grief in administering the affairs of the branch. If an opportunity were given for review of an early draft of proposed by-laws, the points of difficulty could be eliminated prior to adoption.

It was with this thought in mind that the Executive Board instructed the Executive Secretary to prepare this brief explanation to be published in PLATING and to point out that the services of the Law Committee are available to any branch preparing by-laws. The recommendations of the Law Committee to the branch are purely advisory in this connection. In view of this, it is believed that those branches which have not as yet formulated by-laws might profitably use the Law Committee to assist them in writing up the various provisions so as to avoid difficulties which might otherwise arise.

Any branch desiring this service should submit a preliminary draft of its by-laws to the Executive Secretary, with the request that the Law Committee be asked to review them and submit suggestions.

Notes on the formulation of branch by-laws have been prepared by a member of the Law Committee, a copy of which is enclosed for your information.

A. KENNETH GRAHAM,
Executive Secretary

TO: All Branch Secretaries

Subject: *Branch By-Laws: Notes on Formulation*

GENTLEMEN:

Branches are bound by the Constitution of the Society, and by its By-Laws insofar as they affect the Society. Branches, however, have jurisdiction over their own by-laws, and, within the above limits, may adopt what they choose. The following are therefore merely suggestions to branches about to adopt by-laws.

The Law Committee is available for review of proposed by-laws, and branches may if they wish submit drafts for suggestion before taking final action. Drafts should be sent to the Executive Secretary requesting review and comments.

Method of Procedure

The Branch Secretary should collect all branch acts having by-law force. The By-Laws Committee, or other functioning body, should list other details which may be wanted. With this material at hand, successive drafts can be written and worked over until the job is finished. The branch will do well to specify that the new by-laws supercede and nullify all previous enactments with which they may be in conflict.

The laws may be complete and self-contained, or they may be based on the Society's laws and thereby kept relatively brief.

Suggested Minima

1. A preamble, stating authority for existence, giving object, and linking with the Constitution and By-Laws of the Society.

Example: PREAMBLE. Blank Branch of the American Electroplaters' Society, being regularly chartered by the Society, is organized for the Object set forth in the Constitution of the Society and is governed by the said Constitution. The By-Laws of the Branch shall be Part II (BRANCHES) of the By-Laws of the Society as adopted in 1948, with such modifications as are contained herein or may hereafter be regularly adopted.

2. If any officers or committees are contemplated which are not named in the Society's rules, identify them and state their duties.

3. Provide machinery for election of officers and representatives and for setting up standing committees.

4. Include an article on meetings, with sections covering (a) time and place of Regular Meetings, (b) method of call of and limitations on Special Meetings, (c) required quorum, (d) regular order of business, and (e) parliamentary authority. This last might read:

Section 5. Parliamentary Authority. The rules contained in Robert's Rules of Order, Edition of 1943, shall govern the Branch in all cases to which they apply and in which they are not inconsistent with these By-Laws or with the Constitution of the Society.

(The Law Committee risks pointing out the obvious in suggesting that the branch should have a copy of the authority available at every meeting.)

5. Provide for revision of the rules. Nature of this provision will depend on the attitude of the branch; it may follow the lines of either Constitution Part III, or of By-Laws (Society) Part III, and in the latter case by either majority or two-thirds vote, depending on flexibility wanted. For instance:

Section 1. *Method of Revision.* These By-Laws may be revised by (majority) vote at any Regular Meeting, notice of proposed revision having been included in the written call for the meeting.

Do not use the word "suspend" as part of revision. Rules are regularly suspended (Robert) by tacit consent or majority vote. Also: "revised" includes amended, repealed, etc.

Caution

Do not demand the impossible, as "two-thirds vote of active members". Say merely "two-thirds vote" or "two-thirds of votes cast".

Particularly avoid the vicious practice of subjecting the acts of officers to review after the fact. Limitations should be imposed before action takes place; be sure to confer authority commensurate with responsibility.

A. KENNETH GRAHAM,
Executive Secretary

Fundamentals of Electrochemistry and Electrodeposition

This book, by Dr. Samuel Glasstone, is now in its fourth reprint, a testimony to its popularity among all classes of readers. It is interesting to note that it has recently been adopted as text in one Western university for its course in electrometallurgy.

Paper Awards Committee

President A. W. Logozzo announces the appointment of the following Paper Awards Committee for year 1949–1950:

Theodore Voyda, Apothecaries Hall Company, Chairman

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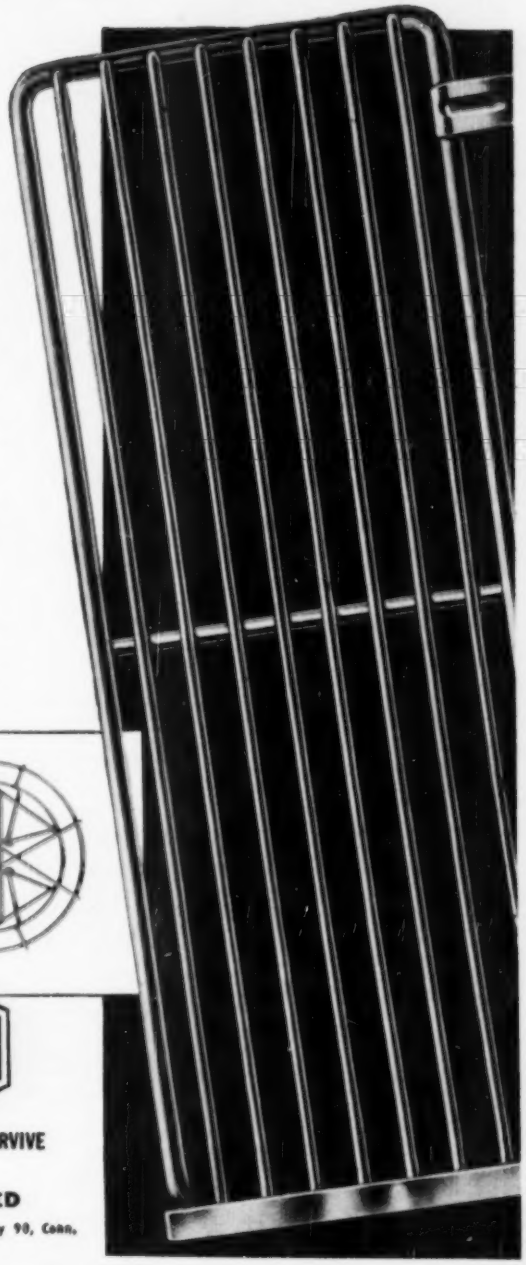
adds chromium-like appearance, multiplies the protection — for only a fraction of a cent per sq. ft.!

This refrigerator shelf shows what you can do for greater economy in your production. If any wire product needs an attractive finish as well as a serviceable one, it's a refrigerator shelf. Significantly, many of today's well-known manufacturers have shelves zinc plated and finished in Unichrome Clear Dip.* For not only is such a finish outstanding in rust-resistance and brilliance, but it also pares costs without impairing quality!

Unichrome Clear Dip is a chemical treatment which produces an inactive coating which is integral with the zinc. The bluish-bright cast imparted is the image of chromium — and what's more, it *stays* that way!

With costs now under close scrutiny, take a tip from the many companies now using Unichrome Clear Dip to "dress up" wire products — check the quality of this finish and compare the costs. It will pay you. Write us for more data.

*For added protection against abrasion, humidity and food chemicals to which refrigerator shelves are subjected, some manufacturers are now using Unichrome Baking Synthetics over the Clear Dip Finish. The Clear Dip Finish needs no priming.



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INDICATE A 830.

A. E. S. News

Ralph G. Colter, Chromium Corporation of America
Philip W. Prouty, Westinghouse Electric Manufacturing Company

Reception for President Logozzo

The reception for A. E. S. President A. W. Logozzo by the Hartford Branch will take place on Saturday, October 15 and not on September 17 as erroneously stated in the September issue. The place is the City Club, Trumbull and Allyn Streets, Hartford, Conn.

Logozzo

Following a dinner at 1:00 P. M., the reception will begin at 2:30 P. M. Mr. W. M. Phillips, Head, Electrochemistry Division, General Motors Research Division, will then present an illustrated talk on "Plating in Motion and Evaluation of Deposits" at 4:00 P. M.

All members of the Society are welcome, especially those belonging to New England Branches who wish to honor the first A. E. S. President elected from New England. Those who wish to attend should send reservations to the chairman of the committee, Mr. George B. Hogaboom, 557 Stanley Street, New Britain, Conn.

✣

Herbert H. Williams

Herbert H. Williams of St. Louis, Mo., passed away on August 23. He was 74 years old.

Before he retired a few years ago, Mr. Williams was with the American Stove Company for fifty years, forty of them as departmental superintendent.

Mr. Williams had been active in the American Electroplaters' Society and its St. Louis Branch since their beginnings. Besides having held most local offices, he served at one time as editor of The Monthly Review, predecessor of PLATING, and as A. E. S. President during the year 1916-1917. He was an Honorary Member of the Society. He will always be remembered by his many friends.

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Cowles H D Cleaner is a new, high pH, heavy-duty soak tank cleaner designed for removal of particularly stubborn soils and grease from steel parts and castings. In formulating H D Cleaner, the twin objectives of efficiency and economy were effectively achieved.

For greater customer convenience, Cowles H D Cleaner is packed in Leverpak drums, 400 lbs. net.

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Branch News

CHICAGO BRANCH

A business dinner meeting was held on August 19 with twenty-two members in attendance. After quick disposal of general business, the balance of the meeting was devoted to a discussion of the 1952 Convention which will be held in Chicago in June of that year. PRESIDENT PAUL GLAB appointed CLYDE KELLY temporary chairman of the convention. Preliminary negotiations for the convention site have already begun. The discussion can be summarized by stating that Chicago Branch is working to put on in 1952 the best convention ever held by the A. E. S.

RAYMOND F. LEDFORD, *Correspondent*

MELBOURNE BRANCH

Business at the 45th regular meeting in the Melbourne Technical College on July 21 consisted mainly of admission of five new members and announcement of plans to hold a cabaret ball towards the end of September.

The guest speaker for the evening was MR. R. N. RIDE, a research officer in the Corrosion Section of the Defense Research Laboratories, who gave a talk on "Corrosion Testing". Dealing first with the nature and causes of corrosion, the speaker then passed on to the fundamental differences between atmospheric and accelerated laboratory testing. He outlined the difficulties inherent in accelerated tests aimed at reproducing long term service conditions; the chief use of accelerated tests being for comparisons between *similar* metals or coatings. Results of the more important atmospheric corrosion tests carried out in various parts of the world were summarized. Various types of accelerated corrosion testing equipment were described, particular mention being made of the novel forms developed by Dr. W. H. J. Vernon and coworkers at C. R. L., Teddington, England.

A useful and informative discussion followed.

JOHN J. DALE, *Hon. Secretary*

PITTSBURGH BRANCH

At the May meeting the officers for the new year were installed by A. E. S. PRESIDENT S. S. JOHNSTON. They were:

President—LEO J. SCHMITT, SR.
First Vice-President—ARTHUR KAUPE
Second Vice-President—REX J. GOLDBACH
Secretary—EDWIN J. SMITH
Treasurer—ROBERT A. WOOFTER
Librarian—LESLIE E. LANCY
Delegates—S. S. JOHNSTON, L. J. SCHMITT, SR., F. R. KELLER
Alternate Delegates—J. P. COBUS, L. E. LANCY, W. J. HENNESSY

(Continued on page 1079)

HOW MASTER LOCK COMPANY cut metal cleaner consumption 33⅓% ...with PENNSALT CLEANERS

The Master Lock Company, big name in the padlock industry, was looking for a metal cleaner that could do a universal cleaning job prior to plating. This cleaner had to remove oils from steel and brass parts in washers, in barrel cleaning, in soak cleaning, and electro tank cleaning equipment. Typical parts are shown above.

The Pennsalt field technician recommended a streamlined cleaning procedure built around one of Pennsalt's fused alkaline cleaners.

Then things really came clean. Cleaning material consumption was cut ⅓! In comparison to the previous cleaner, Pennsalt gave better results for less money.

That's the kind of service manufacturers are getting from Pennsalt. And the kind of economical result:—production costs cut! Check your Pennsalt representative, he can give you the full story on the Pennsalt Metal Preparation Service. Or write: Special Chemicals Division, Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.

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Membership Report of the A. E. S.

Elections

BOSTON BRANCH: James R. Chisholm, John M. Cobouns, Harvey J. Gokey, John A. Swift

HARTFORD BRANCH: Witold E. Kochanski

MELBOURNE BRANCH: J. J. Kavanagh, K. Locke, R. F. Mathers, L. P. Nation, J. L. Perdrix, P. Tikotin

NEWARK BRANCH: W. J. Draydon Ellicott, C. T. Ellingsen

NEW HAVEN BRANCH: Emil A. Fischer, Stanley Paperika

SAGINAW VALLEY BRANCH: James Dodd, Lesley E. Thompson

SOUTHEASTERN BRANCH: Milton T. Harrison, Perry E. Pennington, Paul Stevens

TOLEDO BRANCH: William G. Dale

WATERBURY BRANCH: Frederick M. Gilbert

MEMBERSHIP-AT-LARGE: Joaquin Agullo, Max K. Kennedy, Robert Macnair, Herbert Marston, George Turner

Reinstatements

BOSTON BRANCH: George Larchian, Anthony Sgro

LOS ANGELES BRANCH: James Barker

Transfers

Roman C. Bender from Chicago Branch to Indianapolis Branch; W. H. Mogle to Jackson-Lansing Branch; Jerome L. Ross to New York Branch; Bruce Darling to Southeastern Branch; F. Rolf Morral to Syracuse Branch

Resignations

BALTIMORE-WASHINGTON BRANCH: Stanley P. Watkins

DAYTON BRANCH: John King, Robert S. Redman

HARTFORD BRANCH: Fred Hartman, Harold Leahy, N. Mosesian, D. Tocc, Alldis E. Shailer, Frank J. Wall, Manley A. Zande, Harold J. Verrow

LOS ANGELES BRANCH: Edwin R. Calderon, James M. Carter, James P. Dobbins, Don F. Edwards, Kenneth A. Holden, Ralph Mines, Charles R. Samsoni

LOUISVILLE BRANCH: Charles J. Hines

NEWARK BRANCH: Charles W. Ange, Fred Fidel, C. A. Escoffery, Alexander Chowski, H. A. Krumwiede, Andrew Muller

PITTSBURGH BRANCH: R. O. Hummel, J. R. Rowan

MEMBERSHIP COMPETITION

	Membership April 1, 1949*	New Members	Net Change in Membership	Per Cent Net Change
FIRST GROUP				
CLEVELAND	186	12	+13	+ 7.0
DETROIT	427	34	+29	+ 6.8
NEW YORK	265	21	+15	+ 5.7
MILWAUKEE	132	6	+ 4	+ 3.0
CHICAGO	391	16	+ 7½	+ 1.9
PHILADELPHIA	187	6	+ 3½	+ 1.9
PITTSBURGH	135	9	+ 1½	+ 1.1
BRIDGEPORT	160	3		
GRAND RAPIDS†	160			
HARTFORD	133	6	−10	− 7.5
LOS ANGELES	217	9	−19½	− 9.0
TORONTO	154	6	−17	−11.0
NEWARK	256	4	−34½	−13.5
BOSTON	153	4	−37½	−24.5
SECOND GROUP				
MELBOURNE	81	10	+ 8	+ 9.9
BUFFALO	82	6	+ 7	+ 8.5
SYDNEY†	108	6	+ 6	+ 5.6
BALTIMORE-WASH.	83	5	+ 3½	+ 4.1
INDIANAPOLIS	104	5	+ 3½	+ 3.4
NEW HAVEN	108	2	+ 2	+ 1.9
PROV.-ATTLEBORO.	109	3	+ 1½	+ 1.3
WATERBURY	122	3		
CINCINNATI	90			
ST. LOUIS	107	7	− ½	− 0.5
ST. JOSEPH VALLEY	80		− 1	− 1.2
SYRACUSE	83	2	− 3½	− 4.2
ROCHESTER	125		−10½	− 8.4
DAYTON	98	2	− 9½	− 9.7
THIRD GROUP				
COLUMBUS	38	3	+ 2½	+ 6.6
SPRINGFIELD	50	2	+ 2	+ 4.0
SOUTHEASTERN	38	7	+ 1½	+ 3.9
SAGINAW VALLEY†	67	2	+ 2	+ 3.0
TOLEDO	56	1	+ 1½	+ 2.7
LOUISVILLE	20	2	+ ½	+ 2.5
LANCASTER	59	1		
TWIN CITY	77	1		
ROCKFORD	56			
MONTREAL	69	3	− 1½	− 2.2
SAN FRANCISCO	71	10	− 2	− 2.8
JACKSON-LANSING	59		− 4½	− 7.6
ADELAIDE	76	4	− 8	−10.5
ALLENTOWN-READING	43	1	−10½	−24.4
OUTSIDE COMPETITION				
HAMILTON		14	+20	
WESTERN ONTARIO		15	+15	
AT LARGE	100	13	+ 8	
IN TRANSFER	22		+ 3	
TOTAL A. E. S.	5,237	266	−12	− 0.2

Active Membership, September 1, 1949 5,225

*Subject to correction. †Winners of membership competition in 1948–1949

Suspensions

ADELAIDE BRANCH: V. A. Castello, R. J. Hodson, F. G. Fuss, S. Le Cornu, E. R. Richmond, R. Smith, W. C. Walkely, H. W. Weepers

ALLENTOWN - READING BRANCH: C. C. Ackerman, James Bausch, Ernest Geiger, Vincent Leinheiser, Paul Miller, John Mihalik, Jr., Samuel McCurley, Carl Neff, Charles Schromm, Clarence Williamson, Frederick Zibelewsky, Joseph Zibelewsky

BOSTON BRANCH: S. Aversa, L. Axelrod, S. Baker, M. C. Bloom, W. Bone, W. Bullard, R. Callahan, E. Carter, A. Clarke, W. P. Cornyn, J. W. Coulouris, L. Doane, L. Fobert, H. Foley, W. P. Galvin, P. T. Gokey, A. H. Gower, H. J. Lack, L. J. Love, W. L. Meade, B. Melville, J. T. Montgomery, P. M. Nelson, A. F. Pearson, O. F. Pearson, D. Pungitore, M. Shapiro, R. L. Smith, N. A. Vigeant, E. F. Weiss, Jr., G. W. Wilberger, S. Wolf, M. J. Zopatti, L. Guilford, J. F. Haggerty, J. F. Harney, N. J. Houle, I. M. Johnson, C. L. Kimball

DAYTON BRANCH: Ralph Casey, Don Crull, Thomas Cusick, Virgil Fitzgerald, L. Luaces, Lewis Michael, Francis New, John P. Roberts, C. L. van Derau

HARTFORD BRANCH: G. Giannattasio, John C. McCullough, Edw. E. Murphy, R. H. Pellington, H. B. Wilson

JACKSON-LANSING BRANCH: Harold W. Dow, William J. Gavin, Jr., D. W. McComb, W. J. Pierce, E. H. Spraker

LOS ANGELES BRANCH: Alfred J. Ahlschlager, Robert T. Barron, C. L. Farmer, Emil C. Fasson, Albert M. Hyde, Carl W. Jackson, William T. Lane, James D. Mason, Gus Masuth, William Montana, Jack Naftzger, Sidney Pinhasik, Sam Salzman, Calvin Snelgrove, Harry Steinke

NEWARK BRANCH: L. Bush, John M. Currie, Joseph W. Fasano, Robert S. Goodyear, Richard C. Henkel, W. Earl Hanley, Joseph M. Klein, H. Libovitz, Bennie J. Pedota, Joseph T. Payne, Kenneth Sweeney, Leroy D. Vreeland, Herbert Zschiegner, Vincent J. Carney, Melvin Dressen, George L. Galanti, E. J. Gorczyca, Edward Hackenberg, John Ivanits, John W. Lewis, Herbert R. Potts, Joe Pearlman, James F. O'Brien, Marvin Sims, Daniel Woodey, Jr.

NEW YORK BRANCH: Tom Blair, Frank R. De Paola, Bernard Seltzer, John J. Walsh

SOUTHEASTERN BRANCH: Victor Baran, Ralph B. Goodson, Walter Camp, B. Deutschman, W. J. Burton, T. B. Royal

Deaths

BOSTON BRANCH: C. O. Hardy, W. J. Harney

Branch News

(Continued from page 1076)

Board of Managers—JOHN P. CUNOS (newly elected), W. J. HENNESSY, F. R. KELLER

According to the By-Laws adopted during the year the above-named men will serve as members of the Executive Committee, with the First Vice-President as chairman.

During the summer months the Executive Committee held three meetings at the Sheraton Hotel in Pittsburgh. Committee appointments and reports from the Treasurer and Librarian were the principal topics of discussion.

The following speakers and their subjects have been confirmed to date according to DR. L. E. LANCY, Librarian: October—MR. W. M. PHILLIPS, General Motors Corporation, "Deep Sea Diving in a Plating Cell"; November—DR. WALTER R. MEYER, Enthone, Inc., "Scale Removal and Stripping of Metals"; December—MR. S. S. JOHNSTON, Weirton Steel Company, "Tin Plate Movie".

It has been proposed that the December meeting be an informal party for members and their wives, with refreshments and entertainment to follow the movie. As an additional feature of each meeting, the Librarian will offer a question and answer period.

E. J. SMITH, *Secretary*

TOUGHEST UNICHROME COATING YET!

Now, with COATING 218X, you'll spend even less to maintain racks

Compare this plastisol Unichrome coating for resistance to vapor degreaser, hot caustic and chromic acid solutions. You'll see why Coating 218X stands up longer, saves you money in *any* plating cycle. For among the chemicals used in plating cycles, those three are most destructive to rack coatings. Yet, results in our own laboratory, confirmed in that of a large automotive producer, prove they have *negligible effect* on Coating 218X!

Along with this remarkable chemical resistance goes extra *physical* toughness. Coating 218X has flexibility that absorbs hard knocks without chipping. Surface hardness resists accidental cutting and rough handling. Because it is free-rinsing, it permits continuous cycle operation with minimum dragout.

Write for new prices and data. Remember, if you have no baking facilities, you can still profit from the cost-cutting advantages of Coating 218X. Nearby applicators can serve you. We'll send you names.

UNICHROME

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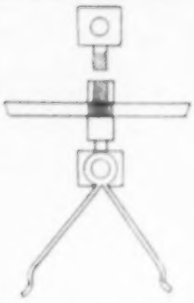

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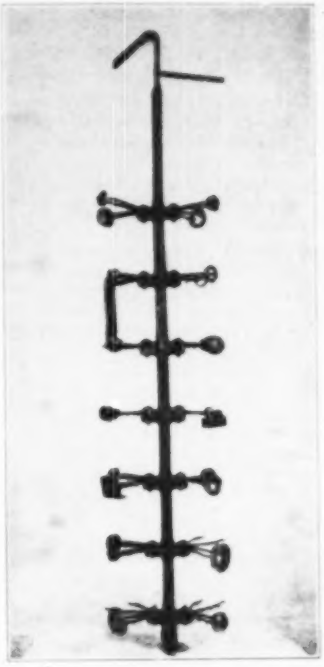

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ALLENTOWN-READING meets third Thursday of each month. Secretary-Treasurer, James F. Riegel, 425 S. 18th Street, Allentown, Pa. Research Finance Committee Chairman, G. W. Ward, 212 N. 6th Street, Allentown, Pa.

BALTIMORE-WASHINGTON meets second Tuesday of October, December, February, and April in Baltimore, and of November, January, March, and May at the National Bureau of Standards, Washington, D. C. Secretary, Vernon A. Lamb, National Bureau of Standards, Washington 25, D. C.

BOSTON meets first Thursday of each month in Hotel Statler. Secretary, Dr. George P. Swift, 53 Galen Street, Watertown, 72, Mass. Research Finance Committee Chairman, Eugene P. Carter, c/o United Carr Fastener Corporation, 81 Ames Street, Cambridge, Mass.

BRIDGEPORT meets first and third Friday of each month in Barnum Hotel. Secretary-Treasurer, Joseph G. Sterling, 134 Colony Street, Bridgeport 8, Conn. Research Finance Committee Chairman, Charles L. Temple, c/o Globe Slicing Machine Company, 224 Selleck Street, Stamford, Conn.

BUFFALO meets first Friday of each month in Markeen Hotel. Secretary, H. A. Fudeman, 534 W. Ferry Street, Buffalo 13, N. Y. Research Finance Committee Chairman, B. P. Fortim, 200 Forest Drive, Orchard Park, N. Y.

CHICAGO meets second Friday of each month at 8 P. M. at Western Society of Engineers, 84 E. Randolph St. Secretary-Treasurer, J. M. Andrus, 3701 Ravenswood Avenue, Chicago 13, Ill. Research Finance Committee Chairman, Clyde Kelly, 740 W. Englewood, Chicago 21, Ill.

CINCINNATI meets fourth Wednesday of each month at 8 P. M. in Engineering Society Headquarters, McMillan Street and Woodburn Avenue. Secretary-Treasurer, H. Roper Davis, 6005 Yosemite Drive, Cincinnati 12, Ohio.

CLEVELAND meets first Friday of each month in Cleveland Hotel at 8 P. M. Secretary-Treasurer, Harry Pochapsky, 24961 Euclid Avenue, Cleveland, Ohio. Research Finance Committee Chairman, E. C. Friedl, c/o du Pont Company, 1335 Guardian Building, Cleveland 14, Ohio.

COLUMBUS meets first Friday of each month at 8 P. M. in Battelle Memorial Institute Auditorium. Secretary-Treasurer, Nathan L. Koslin, 2641 Cleveland Avenue, Columbus 11, Ohio.

DAYTON meets first Monday of each month in Engineers' Club. Secretary, Richard M. Cluxbens, 701 W. Stewart Street, Dayton 8, Ohio.

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LANCASTER meets second Friday of each month at 8 P. M. in Thaddeus Stevens Industrial School. Secretary-Treasurer, Chester W. Smith, c/o Superior Metal Company, Bethlehem, Pa. Research Finance Committee Chairman, Harry Hovis, Lincoln Highway West, Lancaster, Pa.

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PHILADELPHIA meets fourth Friday of each month in Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Streets. Secretary, I. William Marcovitch, 1434 Lardner Street, Philadelphia 24, Pa. Research Finance Committee Chairman, Al Hirsch, 1945 W. Airdrie Street, Philadelphia 40, Pa.

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plating

October 1, 1949

Dear Reader

Thinking the other day about the problems of the research man who is hired to invent new and useful things, I was reminded of a story about the early days of cadmium plating.

A new plating foreman, much impressed with the beautiful cadmium plate that came out of the tank he inherited, soon found to his dismay that the plate got less and less bright as time passed. Something had to be done before the big boss had him on the carpet. He tried everything, more cyanide and less cyanide, more current and less current, etc., etc. Nothing helped.

In desperation he turned to one of the older tank men, "What did Joe Smith do that I don't do?" Mac scratched his head and finally answered, "He spit in the tank every time he passed by". That didn't sound very promising, but having tried everything else, our foreman friend started spitting in the tank. But the brightness continued to decline. Soon he talked to Mac again. "Now tell me, what did Joe do with that cadmium tank"? Mac did not have any answer that day, but on the next he volunteered, "You know, Joe chewed tobacco".

The story does not tell if the new foreman took up tobacco chewing, only that the tobacco got into the tank and the brightness returned.

There is no question but that Mac would have made an excellent research man. He had that very elusive power of observation and that cogitative ability which one does not find any too often.

Sincerely,

Gustaf Soderberg

Editor

Future Meetings

American Society for Testing Materials First Pacific Area National Meeting in Fairmont Hotel, San Francisco, Calif., on October 10–14.

Committee B-8, A. S. T. M. and Subcommittees in La Salle Hotel, Chicago, Ill., on October 12–14.

Electrochemical Society Fall Meeting in La Salle Hotel, Chicago, Ill., on October 12–15, 1949.

American Society for Metals 31st Annual National Metal Exposition and Congress in the Public Auditorium, Cleveland, Ohio, on October 15–21.

National Safety Council Annual Meeting in Hotel Stevens, Chicago, Ill., on October 24–28.

Philadelphia Branch, A. E. S. Annual Educational Session (2 P. M.) and Banquet (7 P. M.) in Broadwood Hotel, on November 19.

Plant Maintenance Show and Conference in the Auditorium, Cleveland, Ohio, on January 16–19, 1950.

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LIQUID BUFFING COMPOUND

the modern Liquid Buffing Compound made with 100% Pure Seneca Standard Tripoli. Nothing to compare with this compound has ever before been offered to the finishing industry.

You accept the challenge?—fine!

SEE PAGE 1033

MAC DERMID
Incorporated
WATERBURY 88, CONNECTICUT

Everyday, 1949

Metal Finishing Foremen
Everywhere
U.S.A.

Gentlemen:

We want you to try these newer, faster, more positive compounds in your factory, with your equipment, on your products. We'll take the risk of proving you their superiority providing they are used in accordance with our specific formulae as described by our technical engineer located in your territory.

CHROMETEX - New, fast-acting, more positive Nickel Activator used to increase the covering power of chrome - eliminates grey streaks and clouds - greatly aids covering of deep recesses of nickel - eliminates or reduces passive nickel due to impurities, poor rinsing or excessive heat. Aids in plating nickel on nickel.

TROXIDE - A series of scientifically developed dry acid salts to be used as replacements for conventional liquid acids when PICKLING and BRIGHT DIPPING METALS. Are easy and safe to use with no carboys - mixing - splashing - burns - fumes - spray - vents - or corrosion. TROXIDE affords better working conditions and requires less maintenance.

ROCHELTEX - When you use this new Copper Addition Agent for economy and uniformity you can cut cyanide consumption up to 50% and increase cathode efficiencies by at least 20% - thereby decreasing plating time or increasing thickness for a given plating time. Carbonate buildup may be completely eliminated. Can be added to any cyanide copper plating solution in any type of equipment.

Other compounds developed for specific applications: ANODEX - Reverse current cleaner for steel. METEX - Burnishing compound. - Reverse current cleaner for zinc base diecastings. METEX FILTER POWDER - filtering aid for bright nickel and all cyanide solutions. CHROME RESISTEX - For cleaning prior to chrome plating. BRIGHT COPPER - For mirror bright copper deposits.

Yours very truly,
MACDERMID INCORPORATED

Harold Leever

Harold Leever
Vice President

HL:mw

MAC DERMID
★ Incorporated ★
WATERBURY 88, CONNECTICUT

USE READER SERVICE CARD; INDICATE A850

LEA
COMPOUND
THE LEA MANUFACTURING CO.
OPEN THIS END
2,502 vs 1,170
*SAME PLANT, SAME OPERATOR, SIMILAR PIECES
(2,502 represents Grade "B" Lea Compound Production per Bar)
(1,170 represents Competitive Compound Production per Bar)

Which would you rather have coming off your production line? The former, of course, *provided* the ratio of "B" Lea Compound cost to that of the competitive material was well within the production ratio. It is . . . proving again that the use of Lea Compound is a much more economical production step.

How, you ask, can Lea Compound be so much better?

BURRING, BUFFING AND POLISHING . . . MANUFACTURERS AND SPECIALISTS IN THE DEVELOPMENT OF PRODUCTION METHODS, EQUIPMENT AND COMPOSITIONS.

Well, here are a few of the Lea "quality" characteristics:

1 . . . a much better and more durable binder is used, resulting in much less "fly off the wheel" waste.

2 . . . very uniform as to grain and binder, resulting in more uniform production speed and finish.

3 . . . the container is much more impervious to moisture loss — our standard all-aluminum container can keep compound in good condition for a year or so if stored properly.

4 . . . all Lea products are produced under strict technical control.

The list of Lea users is constantly growing because more and more are convinced—by tests—that there is more production and better production in a bar of Lea Compound or Learok than in any other material . . . more per dollar invested in compound.

If you are interested in production quality and production economy, you owe it to yourself to be a "Lea" user.

THE LEA MANUFACTURING CO., 16 Cherry Avenue, Waterbury 86, Conn.

Lea Mfg. Company of Canada, Ltd., 370 Victoria Street, Toronto 2, Canada

FOR FURTHER INFORMATION, USE READER SERICE CARD: INDICATE A 857.